

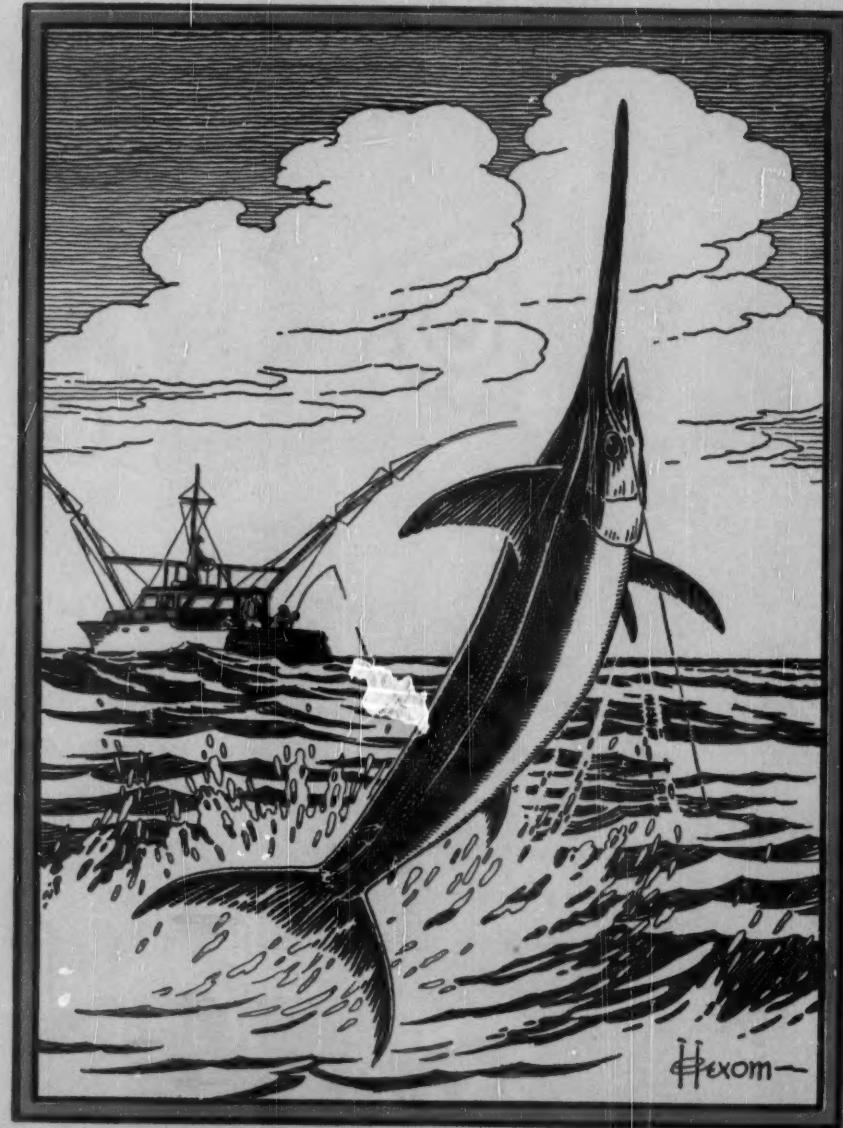
Nature Magazine

FEBRUARY

1958

VOLUME 51
NUMBER 2

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DEAR EDITOR:

I am deeply moved by your announcement that my old friend of the northern mountains, Edward A. Preble, has crossed the great divide. A host of memories of the great Northland jostle each other, clamoring for expression.

I first came to know Preble after his epoch-making entry into the Peace River Country from the west, starting at the Pacific Ocean. He worked his way up the Stikine River, through the Cassiar Mountains, crossed the divide into the headwaters of the Finlay River. From there he floated down through the great continental trough until the Finlay River met the Parsnip River head on, coming the other way. They had it out in a roaring, foaming rapid that was the beginning of the Peace River. The contest was compromised by breaking across the eastern barrier of the Rocky Mountains through a mighty gorge, guarded by Mount Selwyn, through which the Peace River flows majestically out onto the eastern plains on its long journey to the Arctic Ocean.

(The writer said that Preble encouraged him and Bill Patterson to determine whether the Peace River was a barrier between *Ovis stonei* and *Ovis canadensis*. They collected in the area. ED.)

In due time the specimens arrived at the National Museum where they were received, prepared and studied by Preble. They were a motley lot. Some had the spreading horns of *O. stonei*. Others resembled *O. canadensis*. In pelage they were all different. There was the grisly brown of *O. canadensis*. There was a dark pepper-and-salt mixture, a lighter mixture and one specimen very light. Those specimens are still in the National Museum.

Yes, Preble was an accomplished scientist, but he was far more than a conventional scientist of books and stuffed skins. He knew his birds and mammals outdoors where they lived. His vision was broad, but no detail was so small as to escape his notice. He taught me how to distinguish the song of the willow thrush of the northern mountains from that of the Wilson thrush or veery—the voice of the eastern woods. The willow thrush warbles with an upward cadence, that of the veery has a downward cadence. He alerted me to find the tawny lemming, which he wanted to study. He hoped I would find the nest of the evening grosbeak, which was then unknown.

Topping all these talents he was a thorough Wilderness Man—a man of the Big Open Places. When I say this I offer him the highest homage I am capable of expressing.

Sincerely,
FREDERICK K. VREELAND

DEAR EDITOR:

I read with sympathy the item entitled "Occupational Hazards of the Author" in your *Contents Note* of the January issue. It makes me think of an incident that happened, not long ago, in one of the New England States, where an automobile was shot "plumb center"—right through the door. The excuse by the gunner? "It was gray, and it moved."

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Reviews

1001 Questions Answered About the Weather

By Frank Forrester. New York. 1957. Dodd, Mead and Company. 419 pages. Illustrated. \$6.00.

This is the fifth in a series of books answering 1001 questions. As a matter of fact this book answers 1235 questions. The companion volumes answer queries about insects, birds, astronomy and trees. The author went about encouraging people in many walks of life to ask questions about the weather. Thus he discovered what people wanted to know about the weather and then set out to find the answers. The questions and answers are divided into twelve chapters that provide logical groupings, and a good bibliography is provided as well. The number of names for different kinds of winds and storms, for example, is amazing.

O'Po of the Omaha

By Pearl Haley Patrick. Caldwell, Idaho. 1957. The Caxton Printers, 229 pages. Illustrated by Dan Jacobson. \$3.50.

The Omaha Indians lived peacefully in an area along the Missouri and Platte Rivers. They did not fight the whites and maintained their tribal customs. O'Po is an Indian boy of this tribe and his life is portrayed against an authentic background of Omaha customs. This is a fiction story and is written for young readers in the nine to thirteen age class.

Insects—Hunters and Trappers

By Ross E. Hutchins. Chicago. 1957. Rand McNally and Company. 96 pages. Illustrated. \$2.95.

There is high drama and struggle in the insect world, whether it be evidenced by the activities of the cicada-killing wasp or the ever-fascinating lives of various species of ants. The author of this book has been a frequent contributor to the pages of *Nature Magazine*, and he is entomologist of the Mississippi State Plant Board. Dr. Hutchins is also an accomplished photographer and has captured on film graphic records of the dramatic episodes about which he writes in popular terms. Here we have interesting and informative reading for the individual with a lay interest in insects.

The Successful Camp

By Lewis C. Reimann. Ann Arbor, Michigan. 1958. University of Michigan Press. 233 pages. Preface by Dr. Lenore C. Smith. \$4.75.

Conducting the successful summer camp—one that supplies the patron his money's worth and at the same time does a competent educational and recreational job with reasonable return—is no simple matter. The time has passed when it is possible to hew a place out of a piece of woods, erect some cabins and start a summer camp. In this book the author has assembled valuable data for the camp administrator and director.

Instinctive Behavior

Translated and edited by Claire H. Schiller. New York. 1957. International Universities Press. 328 pages. Illustrated. \$7.50.

Of special interest to the student of ethology, this is a most interesting discussion by European zoologists of instinctive behavior in animals. Hitherto the writings here presented have not been available in English, but are now ably translated. The contributors are D. J. Kuenen, Konrad Lorenz, Nicholas Tinbergen, Paul H. Schiller and Jakob von Uexkull. In America study of animal behavior has been largely in terms of the learning capacities of animals. In Europe the approach has been from a different concept, studying animals under natural conditions and analyzing these observations as a basis for a general theory of the nature of instincts.

Briefly Noted

White Patch, a City Sparrow. By Olive L. Earle. New York. 1958. William Morrow and Company. Illustrated by the author. \$2.50. A story for the young reader about the adventures of a sparrow in a big city.

Aids to Botany. By H. J. Bonham, E. J. B. Bish, and J. M. Thompson. London. 1957. Ballière, Tindall and Cox. 226 pages. \$1.75. A student-aid book that should prove to be helpful in the field of botany.

Trees. By William M. Harlow. New York. 1957. Dover Publications. 288 pages. Illustrated. \$1.35. Pocket-size, paper-backed edition of this excellent guide to the trees of the eastern and central United States and Canada.

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Nature IN PRINT

By HOWARD ZAHNISER

What Wealth

"MAN'S CONSCIOUSNESS, so many thousands of years ago, began to separate him more and more from nature and from himself—from nature and from sheerly natural man," writes Geoffrey Grigson in the magnificent volume *Old Stone Age*, which he with his text, and Stevan Celebonovic with his photographs, have recently prepared to demonstrate the Nature-and-art relationships of stone-age men. Yet man—and apparently man alone among species—concerns himself with a quest for knowledge about Nature and about the many aspects of Nature's manifestations. How diverse and successful this quest has been, and how vivid and eloquent are the resulting expressions, are strikingly apparent in a wealth of newly published books that happen to be before me. Instead of choosing from among them for subjects of more detailed discussions, it seems, at this moment, more meaningful to note their diversity, and the wide availability of information and entertainment that they represent. Not the accumulations of a period of time in publication, but only a sample of the offerings of one season, they amaze us with the wealth of our endowments. Avoiding the confusion of plethora, we should be encouraged, indeed, at the opportunities they present for knowledge and enjoyment.

As Stevan Celebonovic and Geoffrey Grigson bring us through photograph and commentary some apprehension of the drawings and rude sculpture of pre-historic men, so these other volumes reveal to us our own present world. It is a revelation afforded us all by diligence and devotion, skill and study, with remarkable competence and brilliance and even a heroism we seldom note.

Dr. Karl P. Schmidt, the senior author of an impressively beautiful and instructive volume entitled *Living Reptiles of the World*, published October 3, 1957, was himself a sacrifice to this heroism a week before the

book was published. "One of these tree or bush-dwelling snakes, the boomslang, *Dispholidus typus*, could give a man looking for birds an unpleasant shock," wrote Dr. Schmidt and his collaborator Robert F. Inger in this volume. The week before the book's publication the Associated Press reported the tragic death of Dr. Schmidt from the bite of a boomslang that he was handling at the Chicago Natural History Museum. The report quoted Dr. Inger as saying that Dr. Schmidt was bitten as the two men were handling the snake. It is an event that makes us appreciate the more highly this elaborate and exquisite book.

Another noted herpetologist, Clifford H. Pope, in another of these newly published books—a volume especially prepared for young people and entitled *Reptiles Round the World*—explains that "the belief that all reptiles are dangerous is far from true," but certainly such danger as there is adds a fascination to an interest in reptiles. This volume, attractively designed and manufactured by Alfred A. Knopf, is subtitled *A Simplified Natural History of the Snakes, Lizards, Turtles, & Crocodilians*. Simple but brilliant in its authoritative but engaging presentation and in its illustration by Helen Damrosch Tee-Van, it has proved to be a welcome introduction to the volume by Dr. Schmidt and Dr. Inger, even for a more sophisticated reader and student than the youths for whom it was written.

For younger readers

Another volume for young readers—even still younger—that has proved delightful is Marjory Bartlett Sanger's story about the adventure that began one Christmas for Brian and Jenny Vogel and their parents when "Aunt Laura" sent them a bird feeder for a gift. This volume, *The Bird Watchers*, illustrated with drawings by Christine Price, not only tells a story but includes an appendix, called "Notes for Bird Watchers," that provides information on feed

and feeders, birdhouses, keeping a field notebook, leading a bird walk, birds' nests, planting for birds, field guides, other bird books, records, and still other information.

Mrs. Sanger, a Nature-camp teacher and editor for the Massachusetts Audubon Society, has assembled for her young readers and for those who may be looking over their shoulders an impressive list of aids. Such contributions, bringing knowledge and understanding within the reach of so many of us, are brilliantly represented among these books before us by a new work that is now among those superbly beautiful and informative bird books that we have so readily available. This is *The Warblers of North America: A Popular Account of The Wood Warblers as They Occur in the Western Hemisphere*.

This book, described on its title page as "by Ludlow Griscom, Alexander Sprunt, Jr., and other ornithologists of note," seems in a very real sense to be essentially a collection of popularly scientific and comprehensive comments to accompany a collection of paintings by John Henry Dick. "It grew," writes Devin A. Garrity, in a publisher's foreword, "out of an original determination by the artist, John Henry Dick. . . . The result, we believe, is a happy one, made the more so by the excellent six-color offset reproductions which were printed in Holland." Such ambition reminds us of Audubon, although the text we have here is a symposium of some 26 writers—all authorities on their several subjects.

From now on *The Warblers of America* will be on the shelves of all who endeavor to maintain a library of essential bird books. Many others who can see in the warblers the same exquisite beauty that we know in butterflies and flowers will also enjoy this volume. There is much of this kind of delight in Anthony J. Huxley's *Exotic Plants of the World*, which he has translated and adapted from Marcel Belvianes' *Beautes de la Flore exotique*. "From tiny succulents to giant cacti and monstrous aroids," says the enthusiastic dust-cover, "the world's exotic plants are pictured in all their extraordinary variety, with 154 photographs, 49 in full color."

"In this book," says Marcel Belvianes of a volume that has a minimum of textual comment or explanation, "plants are preserved in

all the freshness of their first flowering." Very few of the plants, he points out, are native to northern climes. "They are beautiful or striking kinds from other lands, especially warm countries."

Explore your garden

The National Geographic Society in the latest volume of its natural science library has served a similar interest with a richness of text as well as a wealth of photography and of paintings by Else Bostelmann in a volume called *The World in Your Garden*. Reminding us of the origins of our book on *The Warblers of America*, Melville Bell Grosvenor tells us in his foreword that this volume came about because of a suggestion by the artist. "What remarkable things our garden plants are," Mrs. Bostelmann suggested. "We seldom realize that they have traveled all over the world...."

Dr. Victor R. Boswell, introducing his series of vegetable accounts with an article on "Our Vegetable Travelers," tells of his answer to a friend who said: "Next year I want to go in for foreign things. Do you know where I can get seeds?" Dr. Boswell looked over his "jumble of plants" and replied:

"Those tomatoes, snap beans, peppers, lima beans, and potatoes are the only truly American vegetables you have. All the others are foreign—onions, radishes, lettuce, beets, chard, cabbage, broccoli, collards, carrots, parsley, turnips, peas, asparagus, soybeans, mustard, eggplant, and the rest. The foreign plants in your garden outnumber the native ones five to one."

Following Dr. Boswell's vegetable descriptions are accounts of our fruits written by his colleague at the Department of Agriculture's Plant Industry Station, Dr. John R. Magness, who introduces his accounts with an article on "How Fruit Came to America." Preceding both these more practical series are Wendell H. Camp's descriptions of flowers introduced with an article on "The World in Your Garden." The book itself is thus, in effect, a bound "National Geographic" magazine with various authors and much illustration.

Reptiles, birds, flowers, trees (fruit trees)—all are here in these volumes lavishly presented. And with them is a simple handbook with black and white drawings that rivals any of these books for interest. It is

Palmer's *Fieldbook of Mammals: A Unit in a Series of Aids to Conservation*, by E. Laurence Palmer, who is so well known to readers of *Nature Magazine* and who has here in this book as so often in this magazine presented matters of fact so interestingly that I have read on from description to description throughout the volume.

The book, of course, "aims to assist in the identification and classification of mammals," but, as it says itself, "goes beyond that, giving also such data as body temperatures, which may be important to a physician; food, which is important in a farmer's economy; habits, which are meaningful to the conservationist; and behavior, which may help to mold our souls." It also goes further than other mammal handbooks in its inclusion of domestic animals—dogs, cats, for example, and man himself. I have thought (humorously) of the interest there would be in a mammal-book account of man himself, and here it is, with such matter-of-fact data we collect on other species but concluding with a duly solemn reference to our machines, our means of communication, our "picturing what we see," and our "satisfaction in sounds conceived by great musicians and presented to us by great artists."

Facts prevail

Dr. Palmer thus with fact helps us to correct our separation from Nature—with which we started out these browsings in Geoffrey Grigson's and Stevan Celebonovic's volume on the *Old Stone Age*. In another of these new books Paul L. Errington philosophically suggests a renewal of our conscious relationships. Professor Errington's volume is on the wildlife of marshes, published this November with the significant title *Of Men and Marshes*—a thoughtful and a charming book that increases our understanding and offers us wisdom, too. We shall have to return to it another time, but its concluding concern with "the philosophy that man should 'work with and not against Nature'" is particularly appropriate to our own conclusion for these samplings of the evidence in current books of our human quest for knowledge and understanding of Nature—from which, as Geoffrey Grigson wrote, "man's consciousness, so many thousands of years ago began to separate him."

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"Whatever may be the emotional hazards of differing metaphysical and political belief," writes Dr. Errington in the concluding sentences for *Of Men and Marshes*, "'working with Nature' implies avoidance of misconceptions as to the nature of Nature and, going further, some faculty for choice between wise and unwise alternatives. The lessons as well as the beauties of marshes await the perceptive, as do the lessons and beauties of the skies, of the seas, of the mountains, and of the other places remaining where man can still reflect upon lessons and beauties that are not of human making."

Rich indeed are we in the wealth of our literature helping us thus to appreciate whatever in Nature we may experience!

The Bird Watchers. By Marjory Bartlett Sanger. New York: E. P. Dutton Co. 1957. 164 pp. (6 by 8½ in.) with 75 drawings by Christine Price and appended "Notes for Bird Watchers" including bibliography. \$2.75.

Exotic Plants of the World. Translated and Adapted from Marcel Belvianes' 'Beautes de la Flore exotique' by Anthony J. Huxley. Garden City, New York: Hanover House. 1957. 95 pp. (8½ by 10½ in.), with 49 photographs in color and 105 in monochrome. \$4.95.

Living Reptiles of the World. By Karl P. Schmidt and Robert F. Inger. Garden City, New York: Hanover House. 1957. 287 pp. (8½ by 11½ in.), with 122 monochrome photographs and 3 drawings in the text, 145 photographs in color on 80 plates, and index. \$10.

Of Men and Marshes. By Paul L. Errington. New York: The Macmillan Co. 1957. 150 pp. (7 by 10½ in.) with 23 drawings by H. Albert Hochbaum. \$4.50.

Old Stone Age. By Stevan Celbonovic. With a Commentary by Geoffrey Grigson. New York: Philosophical Library. No Date. 96 pp. (9½ by 12½ in.) being 72 photographs with text commentary, 1 page of 20 drawings of "Characteristic Tools of the Middle and Upper Palaeolithic" and a tabulation of "Chronological and Cultural Framework of Prehistory." \$10.

Palmer's Fieldbook of Mammals: A Unit in a Series of Aids to Conservation. By E. Laurence Palmer. New York: E. P. Dutton & Co. 1957.



Marjorie Matthaei



John L. Blackford

OUR AUTHORS FOR FEBRUARY

John L. Blackford, whose by-line has appeared many times in *Nature Magazine*, lives in Libby, Montana, a writer-naturalist and wildlife photographer whose particular interest in bird-life study has taken him into the back country of the West and Southwest . . . Bill Geagan, author of several books on the outdoors, is a Maine outdoorsman and conservationist . . . Leo A. Luttringer is conservation education assistant in the Division of Administration of the Pennsylvania Game Commission . . . Mabel Irene Huggins, for many years engaged in educational work in China, has more recently been employed in the design department of the Kansas State Highway Department, and makes her home in Topeka . . . Marjorie Matthaei, another resident of the Sunflower State, is a science article writer who, in her own words, is "particularly interested in using scientific discoveries to strengthen our faith, rather than to destroy it" . . . Robert Given is a marine biologist, presently working on a research project at the Kerkhoff Laboratory, at Corona Del Mar, California . . . E. E. Stanford is a professor of botany at the College of the Pacific, in Stockton, California . . . Hugh M. Halliday is a veteran Canadian naturalist, photographer and reporter, whose field trips have taken him from Newfoundland to Vancouver, and into the Arctic . . . and our second Canadian contributor for the month is Russell J. Rutter, whose home is at Huntsville, Ontario; he is an active member of the Ontario Bird Bander's Association, is employed by the local newspaper, and still finds time for professional article writing, as well as work with the correspondence branch of the Ontario Department of Education . . . Noel L. Roberts is an Australian writer-photographer living in Sydney . . . Louise Leighton, of Baraboo, Wisconsin, is a free-lance newspaper and magazine article writer, who also teaches poetry . . . Alexander F. Skutch, botanist, ornithologist, and distinguished authority on the birds of Central America, lives in Costa Rica.

321 pp. (4½ by 7½ in.) with endpaper charts and numerous text drawings of mammals, skulls, tracks, and scats, and index. \$3.75.

Reptiles Round the World: A Simplified Natural History of the Snakes, Lizards, Turtles, & Crocodilians. By Clifford H. Pope. New York: Alfred A. Knopf. 1957. xv + 194 + X pp. (6-1/8 by 8-3/8 in.), with more than 100 drawings by Helen Damrosch Tee-Van, List of Common and Technical Names, and Index. \$3.50.

The Warblers of America: A Popular Account of The Wood Warblers as They Occur in the Western Hemisphere. By Ludlow Griscom, Alexander Sprunt, Jr., and Other Ornithologists of Note. New York: The Devin-Adair Co. 1957. Illustrated by John Henry Dick. xii + 356 pp. (8-1/8 by 10½ in.), with 102 text drawings (including range maps) and 35 plates reproducing paintings of some 60 species, biographical notes on the contributors, classified list of the wood warbler family, suggested reclassification of the warbler genera, and index. \$15.

The World in Your Garden. By Wendell H. Camp, Victor R. Boswell, and John R. Magness, Washington, D. C.: National Geographic Society. 1957. 232 pp. (7 by 10½ in.) with foreword by Melville Bell Grosvenor, end-paper illuminated map of the world by E. E.

Alleman, color photograph of mural by N. C. Wyeth, 91 paintings by Else Bostelmann reproduced in color, many marginal drawings, 8 monochrome plates of flower arrangements, 18 photographs in color, 18 black and white photographs, and index. \$6.50.

Briefly Noted

No Stranger to the Earth. By Sylvia Trent Auxier. P.O. Box 332, Mills Valley, Cal. 1957. The Wings Press. 56 pages. \$2.00. This is the fourth book of collected poetry by this able poet, whose work has appeared widely in publications. Nature provides her with inspiration for many of her poems.

The Natural History of a Wasatch Spring. By Claude T. Barnes, 113 E. 2nd S., Salt Lake City. 1957. Wilson Book Store. 98 pages. \$3.00. A Utah naturalist watches spring come to the Wasatch Mountains and records her moods and manners.

Rocket. By Sir Philip Joubert de la Ferte. New York. 1957. Philosophical Library. 190 pages. Illustrated. \$6.00. The rocket story from man's first modest efforts to Peenemunde.

Japan Dictionary. By Lewis Bush. New York. Philosophical Library. 226 pages. \$10.00. Introduction to the old and the new in Japanese history, arts, literature, folklore, customs, religions, etc.

Contents noted

BY THE EDITOR

PROTECT OUR PUBLIC LANDS is the slogan chosen this year for the observance of National Wildlife Week sponsored by the National Wildlife Federation and to be celebrated March 16 to 22. The Federation points out that public lands in several categories are held in trust by local, state and federal governments and that "these lands are rich in resources, diverse in meeting our wants for water, minerals, timber, grass and recreation. One of the greatest of our heritages, they are an ingredient of American living that we wish to save." This public domain has become a vital part of the American way of life, and that of it which is left must be protected to the end that we may continue to enjoy that way of life. "But," the Federation warns, "just as we have grown to value the many benefits of this public estate, so must we begin to assume a greater responsibility for taking care of the land itself—the soils, water, minerals, plants, animals, scenery and wilderness. Our use must be keyed to a basic concern for these resources so that they can continue to satisfy our wants in the face of rapidly increasing pressures upon them." The Federation, whose address is 232 Carroll Street, Washington 12, D. C., has various materials available to aid in the observance of this Week.

WE NEVER CEASE TO WONDER at the way in which we complicate our lives. This is most recently brought home by receipt of a release about a product called "Spray-Gone." The announcement points out that growers of fresh fruits and vegetables use a variety of powerful chemical sprays. These are "produced with an oil base so that rains will not wash them off crops; thus they are not readily water-soluble if you the consumer tries to wash them off with plain water." Significantly and alarmingly, the announcement continues; "All of these sprays are toxic and poisonous to human beings (as well as to insects) and the toxicity is cumulative and can result in great harm to consumers. . ." So we appear to face a menace when we eat fresh fruits and vegetables, and we must give them special treatment if we do not wish to accumulate toxic matter that will do violence to the human anatomy. We shall never be able to understand why a country that so emphasizes pure foods and drugs and sanitation permits the unregulated use of toxic poisons on things that we eat, and creates a situation in which safety demands use of a product such as is mentioned in this item.

THE MORE WILDLIFE SANCTUARIES THE BETTER has long been a slogan of the American Nature Association, as any long-time reader of *Nature Magazine* well knows. And through the years more and more people have set aside acreage in sanctuary status. Many of these reserves have been for the personal enjoyment of Nature enthusiasts and their friends. However, no few such areas "graduate" to the status of local institutions with value to the community, youth groups, and schools. Also the number of sanctuaries set up in a permanent status, and managed as such, has steadily increased. This makes sanctuary management a professional activity. For the past two years the directors of sanctuaries maintained by the Massachusetts Audubon Society have met annually to exchange experiences and discuss techniques. This has now evolved into a proposal for a conference of sanctuary managers, especially those in eastern areas. It is planned to hold such a meeting September 26-27, 1958, as a workshop for those active in carrying out such responsibilities. Further information may be obtained from David Miner, Cooks Canyon Sanctuary, Barre, Massachusetts.

HAWKS GOT A REAL BREAK during the recent migratory season as they passed down their ancient flyways along Pennsylvania's eastern mountain ridges in 1957. Independent investigation by the Hawk Mountain Sanctuary Association revealed that the Pennsylvania Game Commission did an excellent job of enforcing the new law protecting all hawks along this flyway. Also an effective educational campaign was conducted and the slaughter of past years was effectively stopped. The Sanctuary Association adopted an appreciative resolution heartily commending the Commission for its "effective and energetic work done to enforce the new law restricting the shooting of hawks. . ."

THE KENAI PENINSULA OF ALASKA may seem far away to most of us but it is a piece of property in which we all share ownership. On the peninsula is the Kenai Moose Range, set aside to protect these animals, as well as rare trumpeter swans and other wildlife. However, oil has been struck within the borders of the Range, and the fever of an oil boom runs in the veins of the people of Anchorage, Alaska, and points thereabouts. But Secretary of the Interior Seaton reversed the policy of his predecessor in office and established protection against unrestricted oil prospecting in wildlife refuges. It was not prohibited entirely, but it was severely restricted and outlawed in areas where it was or could be a menace to wildlife. Following this first strike, the oil people want to rove all over the Range prospecting for oil. The effect of such an invasion on the resident animal life is obvious. Pressures on the Secretary are great and they can be offset only if conservationists rally to his side.

R. W. W.



PHOTOGRAPH BY THE AUTHOR

Loud, sweet, mysterious bird notes brought the author running to the tangled border of a sun-baked wash in the Sonoran desert, close to the Mexican border.

Bright Wings in the Mesquite

By JOHN L. BLACKFORD

WHEER-EET'! WHEER-EET'! Wild, stirring, clarion-clear, sudden calls pierced the oppressive heat and late morning stillness.

Loud, ringing, incomparably sweet, even for bird notes, that liquid whistling alerted the desert. It brought me running to the scraggly mesquite border of a sun-baked wash, the most unpromising spot imaginable for the surpassing beauty I was to find there. The parched, winding, gravel-paved watercourse was overhung by sprawling ironwood-mesquite-paloverde border, and divided by brush-covered sand bar. Yet, the thirsty streamway was still the most hospitable haven offered to wildfolk on this heat-seared stretch of Sonoran desert, west of the Ajos in Organ Pipe Cactus National Monument.

The dramatic call-notes reminded me so much of the cardinal's clear, free whistle—although richer, more bell-like in their exquisite clarity—that I fully expected to discover a performer of tropical brilliance and rarity. I was not disappointed.

However, as I crept down the wash under lavender sweet-pea bloom of the archaic ironwoods, scratched

efficiently by curved talons of the catclaw tangles, the first flash of color to capture my binoculars was not the blaze of an exotic marvel. Instead, my eyes met the brilliant jet-and-gold of a Townsend's warbler!

True, it was early May. The migrant jewel somewhere must cross the border. But it was startling to study him, now disclosed to view in thinly green-veiled mesquite, with saguaros beyond as a backdrop. Rightly, one should have been striving merely to glimpse the dazzling sprite in tops of mighty hemlocks, firs and larches; or pursuing his meteor flash through cathedral spires of the northern spruces. I would have carefully examined the glasses, were it not that, once seen, you never mistake Townsend's warbler.

Wheer-eet'! Wheer-eet'! Breaking the spell of that golden forest bird, mysterious calls again loudly severed the silence. I wrench the glasses away from the siren warbler. They were caught by new movement in the mesquite...

An earth-brown curve-billed thrasher, born to the forbidding cactus plain, but already exhausted by spading its pebbled floor in the May-time heat, had come from

the open cholla. She was breathing open-billed in the scattering shade. Perspiration streamed from under my sun helmet, poured into my eyes, and blurred the thrasher image as in a mirage. Again the mystery was unsolved.

With another striking salutation, the elusive call moved away along the thinning fringe of the wash. The binoculars doggedly followed, scraping the sand of the dry wash bed in a crawl under the broken trash of an old palo-de-fierro. Again there was a magnetic flutter of wings in the mesquite border. The search . . . the find? The glossy sheen of a phainopepla, that held the glasses entranced on other occasions, now only delayed them.

Then they revealed him! Many disappointments await along bird trails. But what other bird so completely fulfills expectation as pyrrhuloxia, rose-crested elegant of the mesquite?

Rose-breasted and soft brown-gray, he is truly a finch—yet one that might have come from below the equator. Wings and tail are of dull red; parrot bill of yellow; underwings, crest and throat of geranium. More, the roseate cardinal speaks so eloquently with his vivacious headdress as to convey every colorful mood and emotion.

In tornillo, honey mesquite and thorn tangle, the Southwest's pyrrhuloxia is just rare enough to be always a startling discovery. Just shy enough, as proved by his parting *wheer-eet'*, to leave never enough of haunting perfection.

And the mesquite! It is ever the green shrine of allure and adventure.

In the rich, alluvial bottomlands, thickening the sandy washes and arroyos, frequenting Lower Sonoran slopes and mesas, mesquite is the most important tree of the desert. Once it knew the drainage areas of the desert grassland and short-grass prairies. Now it moves out to the over-grazed pastures, one of the most widely spread cover plants of the Southwest.

Mesquite is an indicator of water. Usually, the green riparian strips are traced by its verdant strands. They signal from far off the welcome promise of flowing water in a thirsty land. Just as likely, it bounds the dry, hot-bedded streamways; for, better than any other, mesquite finds and follows the underground channels. There, as on the grassland plains, it signifies at depth a sweet-water level. Down even fifty or sixty feet, with enormous rootage—although commonly but a dwarf tree, or shrub, at the surface—mesquite reaches for life-giving moisture. Above, under its light, lacy shade, mammal and bird alike are grateful.

Closely akin, the screwbean, or tornillo, mingles with

mesquite on the hottest flood plains. Or it may fringe the mesquite belt along lower, warmer river courses. Both are mimosas. Their compound leaves form frond-like, ferny foliage that drapes thorny branches in thin, translucent tresses of bright green.

Years since, on an early expedition from Montana to the Arizona desert, I hastened the car south, thinking to find in mid-March spring's seductive arrival upon the Hassayampa Plain. But the morning before, I awoke to snowfall in Joshua forests, north of Chloride. When, at last, we descended to the warm embrace of the Lower Sonoran, there was yet no bloom; even in the cactus gardens below Date Creek.

April at Wickenburg finally stirred the river bank cottonwoods into new leaf. With the month half gone, cactus wrens and thrashers nested in numbers across the cholla-guarded bajadas. Beavertail's pink-purple blossoms burst into magic bloom. Although willows and arrow-weed now were greening the streamsides, mesquite thickets and groves beside the cottonwood borders were naked and brown. Not a tinge of their delicate green screened the wide, sand-floored stream bed, or



PHOTOGRAPH BY THE AUTHOR

A young mourning dove graces a bough of lacy-leaved mesquite. The soft cooing of this bird is a familiar note of the mesquite forest and thicket.

brought birds to expected riparian shade. For its full promise, mesquite's feathery foliage delayed until the end of the month.

Concerned with the idling season, I protested to an old desert rat whose ancient outfit, like mine, was held up by a bleating band of sheep crossing our trail from the Vulture Mountains. He grinned, furrowing leathery face and crevicing corners of glare-tired eyes. "Mesquite, she is very wise," he confided, pausing to patina a quartz pebble with accurate tobacco stain, "mostly

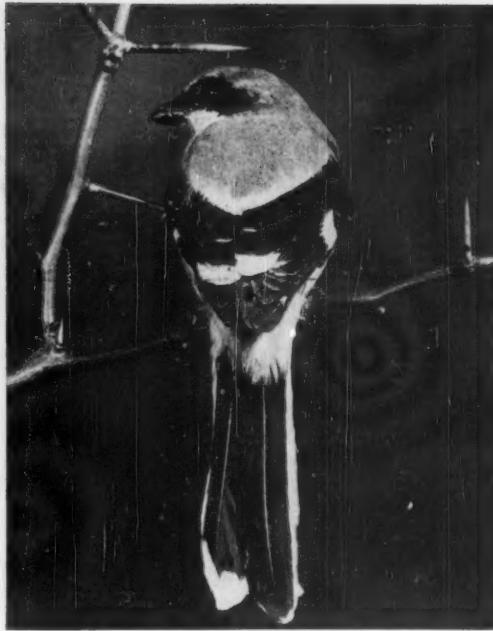
she never gets caught by the frost."

At last came the tardy leafing, and with it another marvel of the mimosas. In catkin clusters, from April into July, are hung the green-gold honey-flowers of mesquite. Like fuzzy, golden caterpillars they decorate the many-stemmed shrub or short-trunked tree. Honeyed fragrance pervades the miniature groves and thorny thickets. The murmuring hum of myriad bees rises and falls in streamside strands. This is the most valued honey plant of the State. The bees, if one mark their excitement, grow drunk with sweet abundance, pollen-yellow with mesquite's golden life-dust. Yet, theirs is a minor chorus, and a modest color, compared to the birds.

That flitting flame, the vermillion flycatcher, is like a scarlet butterfly in airy aisles of mesquite. Fluttering high above its green stream borders, he hovers in flight display—then drifts down in a fiery glide to his mate.

The summer tanager favors not alone the cottonwoods, but on occasion may nest in mesquites by the Hassayampa. Once, in mid-May, the yellow-green of the female was seen covering her to which I was drawn by the vermillion flash of the male illuminating the verdant grove. His "pompeian and bright jasper red" would set the wood alight, it seemed, come summer's heat and drought. But his cool, clear calls are reassuring.

As though in deliberate contrast, these gold-tasseled groves feature the phainopepla. His shining sleekness, in polished black, gleams with steely reflections. His flight exhibits a white-trimmed elegance of wing that sets off sharp, conspicuous crest, and a blood-red eye startlingly revealed by the glasses. Coral-pink berries of desert mistletoe, festooning the the crowns of mesquite, ironwood and acacia, are certain to attract him. Its parasitic clusters provide phainopepla with



PHOTOGRAPH BY GEORGE M. ERADT

In the mesquite, catclaw, ironwood and palo verde thickets the loggerhead shrike regularly builds its cottony nest, and impales its lizard, mouse, and insect prey.

in mesquite-tornillo tangles. The most that may be claimed for such places is that the spiked needle-thorns of screwbean and mesquite are straight—a sharp but honest armament, when compared with the hooked talons of cat's-claw, the devilish, clutching "tear-blanket" acacia of the desert region.

The Gila woodpecker is a colorful excavator of homesites for cavity-dwelling desert and mesquite stream-border birds.

PHOTOGRAPH BY HARRY AND RUTH CROCKETT



favorite sites for cradle construction, of which his mate is permitted approving inspection.

Lucy's, the smallest of our wood warblers, hides her home behind bark-curls of mesquite. Tiny yellow-headed verdins build their barricaded nest-balls where catclaw, ironwood, mesquite and smoke tree fringe the desert washes. At lush stream borders in the Southwest, mesquite as assiduously hides the yellow-billed cuckoo, as it openly flaunts redbird and silky flycatcher. Riparian thickets, dense tornillo tangle and wood, are retreats where lurk the legendary "rain-crow" in this arid land.

It is the secretive, black-faced Abert towhee, however, that during nesting time accounts for the well-scratched hide of the photographer—if the bird-man believes that great discoveries readily await him

Towhee, himself, is the extremely busy caretaker of the trashy floors of these seductively green and winding ribbons that belt water-courses traveling across the desert. In their dense, mysterious mazes, under a low ceiling of feathery fronds, he industriously stirs the ground-litter leafage. To him is given the responsibility of janitoring the hot, Lower Sonoran, river-valley stream borders, delving out the insects of their sheltered floors.

Typical of mesquite stream-border thicket and strand, or tornillo of valleyland woods, Gambel's quail prefer interrupted and edge cover. There, amid scattered tangles, coveys of the swift little desert pedestrians dash for thorny safety while yet you stand numbly in your tracks.

Kuk-kow'-koo, kuk-kow'-koo. *Kuk, kuk, kuk, kru'.* The strange, fantastic call of the white-winged dove is the pervading voice of the mesquite forest. You can never gauge the opulence of these green wonderlands until you know their former splendor, and the abundance there of the Sonora pigeon.

"Following watercourses that drain the southern desert," wrote A. A. Nichol in *The Natural Vegetation of Arizona*, ". . . dense forests of mesquite will be found . . . (After) the summer rains and floods many are almost tropical in aspect, as innumerable vines increase the density of the canopy, and every little opening becomes a tangle of . . . careless weed, sacaton, *Dondia*, and other plants."

With settlement, these intriguing woodlands, wherein the usually dwarfed mesquite once grew to great height, have departed. Remnant groves are but fragmentary developments compared to the former glory of that "arid, semitropical jungle," the Grand Mesquite Forest of the Santa Cruz. There, sunken waters of the stream rose in a river playa in braided channels of occasional surface flow, creating a timberland of mighty mesquites. They reminded Herbert Brandt of the "semiarid, hotland Sinaloa jungles."

Even in 1935, Dr. Brandt could discover a cinnamon-boled giant with a girth of thirteen and one-half feet, and a crowning height of seventy-two—probably more than a sapling when Coronado and his clanking *conquistadores* rode that way.

In 1920, Dr. Alexander Wetmore could tell of the doves: "On my arrival in June I found them . . . congregated in large colonies in suitable mesquite *montes* near the Gila River. . . it is believed that there were at least two thousand pairs in the largest colony. . . the volume of sound was so great that it carried readily for . . . a mile and yet the tone produced was so soft that it was not deafening when near at hand. . . Although it filled the air with the same effect as that produced by rushing of water, other sounds, the song of a Redwing or a Lucy's Warbler, the cooing of a Mourning Dove. . . were heard through it clearly."

Within a decade, even the Grand Mesquite or Tucson Forest itself began falling to the woodchoppers. In 1951, to Herbert Brandt, came the

task of writing its epitaph: "Again the heedless hand of man destroys an immeasurably old climax growth, ruining forever an exceptional monument of Nature."

The long, sweet-pulped, string-bean pods of mesquite ripen in autumn. Together with their shiny, brown seed-capsules, and any resident weevils, they are ground into pinole, a meal that makes sugar-rich cakes for the Pimas. As the fruiting of saguaro brought New Year to the Papagos, so the eight seasons of the Cahuillas were told by the growing beans of mesquite.

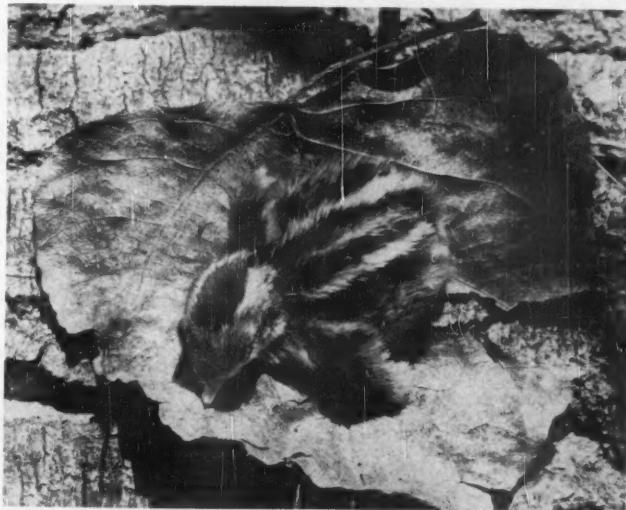
Tornillo's tightly twisted, spirally coiled, peculiar pods are similarly relished. Like the sweet, plump bean-pods of velvet and honey mesquite, they are eaten green as well as ripe. And, while the mesquites differ from usual members of the pea family, and do not split their ripened seed-pods, yet many wildfolk share the harvest.

What shall we say of honey-flowered mesquite, friend of gallant phainopepla and elegant pyrrhuloxia? Although its home is first by the river courses and dry-bedded washes, it, too, tells the strange and exciting story of the desert.



In the curl of a broad cottonwood leaf, a Gambel's quail chick finds momentary comfort and security. The species is typical of the mesquite and mesquite-cottonwood stream-side thickets.

PHOTOGRAPH BY THE AUTHOR



TREE IN WINTER

*The tree in winter
Desolate and bare
Rails and moans at the wind
for stealing
Her beautiful auburn hair.*

*She whines with cold
And hangs her head to cry,
Then blows her nose with a
whistling sound
On a piece of winter sky.*
Patterson Leap



Black bear cubs, like other youngsters, enjoy a good romp. This one has chosen a poplar tree for some aerial sport.

Among the larger mammals of the North American continent, the common—or perhaps we should today say, not-so-common—black bear has had somewhat more than its fair share of persecution at the hands of humans. Is this intelligent animal doomed, on lands unprotected by park or sanctuary status, to the status of a peanut-and-candy snatching childrens' attraction at roadside catering-places, or will it continue in our more heavily forested areas as a species with a future? Leo A. Luttringer and Bill Geagan tell the stories of the black bear and its fortunes in two eastern States with widely divergent philosophies concerning this mammal—the States of Pennsylvania and Maine.

Bears in the Keystone State

By LEO A. LUTTRINGER

REMARKABLE as it may seem, the black bear, which, when fully grown, may weigh from 200 to 600 pounds, begins life as a creature less than a foot long, and less than one-half pound in weight! And the black bear is not always black, either. It may be red, white, blue, brown, yellow, silver or gold—or black.

In the eastern United States, the animal is almost always black, but those of the Mississippi region are frequently of a cinnamon color. In the Yellowstone Park area there are many brown black bears, and in the foothill country of Wyoming and Montana, early settlers found golden taffy-colored specimens that they called sun-bears. Also, in the Rocky Mountains, a bluish-colored bear was found. These differently colored animals at first were thought to represent different species, but it has since been learned, of course, that they are merely color phases of the black bear.

It is a matter of common knowledge that bears hibernate during the cold, snowy, winter months. During late summer and autumn, the animals eat voraciously, day and night, to fatten up for the winter, and they are not particular about their diet. Fruits, berries, grass, roots, nuts, insects, mice, carrion—in fact, almost anything edible is consumed, and it has been said that a bear will eat anything that a pig will eat. In late summer and autumn, the black bear figuratively makes a pig of itself. Day by day, it grows fatter and rounder.

When first it goes into its den, the bear sleeps naturally, and is easily aroused. But this sleep gradually de-

velops into a real stupor, from which the animal usually does not revive until March or April, unless in some way disturbed. Winter dens vary from deep, snug natural caves in rocks, to hollow trees or holes under upturned roots. Sometimes beds are even made under windfalls, or in thickets.

Late in June, or early in July, in the northern States and southern Canada, black bears that are more than three and one-half years old are ready to mate. For a week or more, the partners are together. Then, usually in the later part of July, they separate and go their own ways; if they meet again, it will be as strangers, or perhaps even as enemies!

The gestation period lasts about seven and one-half months in wild bears, and the tiny cubs are usually born late in January or early in February, while Mama Bruin is in winter hibernation. There may be from one to six cubs in a litter, and usually two; but occasionally, especially if it is the mother's first litter, there is only one. Three cubs are not uncommon, while the birth of from four to six is a fairly rare occurrence. The cubs are blind, and their nakedness is covered only by a sparse coat of fine, black hair. Unless she loses her cubs early in the season, the female breeds only every other season.

By the time the female is ready to come out of hibernation, when the weather has settled and the ground in the mountains is partly cleared of snow, the young cubs are ready to venture out into the world. Their eyes were open about forty days after their birth, and by late

March, or early April, they are about two and one-half months old. As mama sets out in search of food, the little ones patter along behind her.

The family does not return to the old den. When the youngsters are sleepy, mama's big body curls protectively around and partly over them. It might be noted that the female obviously is no believer in the modern theory of child psychology. The time-tested method of cuffing a disobedient youngster is her way of bringing up her children to be good citizens.

Throughout the summer, the mother wanders within a radius of about ten miles with her growing family, feeding on roots, berries, vegetation, ants, fish and carrion. Although the young are weaned in August, they are thought to go into hibernation with their mother during the ensuing winter, and to remain with her until the following mating season. By that time, the young ones are well grown, and are off to fend for themselves.

The black bear is not a gregarious creature, and usually leads a solitary life, except during the mating season, and when mother and cubs are still a family group. But, in spite of a preference for living alone, this animal likes to play. Instances have been noted of black bears frolicking with coyotes and other animals.

Contrary, perhaps, to general belief, the black bear is neither slow nor clumsy. It can run much faster than a man, and can glide through the forests as silently as a black shadow when it smells or senses danger. Bruin could not *see* danger unless it were right under his nose, however, for vision is quite poor. It takes no chances, and any unaccustomed odor sends it scurrying to safety. A black bear will not attack a man unless wounded, or with cubs. And, even then, the attack is one of desperation; ordinarily, it will run like a rabbit from the sight, sound or smell of a human.

As civilization has encroached on our forests, and lumbering operations, forest fires, market hunting and trapping have taken their toll of wildlife, the black bear's habitat has been greatly reduced, so that by the beginning of the twentieth century, this mammal could be found only in a few wild or mountainous parts of the United States. The black bear seemed, at one time, to be destined to become only an attraction at our public zoos and museums.

The story is not all, however, on the debit side of the ledger. The State of Pennsylvania has today, strange as it may seem, a splendid population of black bears. Many people, thinking of the Keystone State, might find this hard to believe. They call to mind the coal mines, the steel mills, the factories and crowded cities. It is rather difficult to asso-

ciate wild bears with a State in which there is so much evidence of civilization. The truth is that Pennsylvania has more than twelve million acres of forest land, much of it rugged mountainous terrain that is good bear country.

There is a story, of course, behind the present abundance of black bears in the Commonwealth of Pennsylvania. Before the coming of the white man, there was little danger that American wildlife would ever be other than plentiful, for the Indians were contented to kill creatures only when they needed them for food. At first the settlers, like the Indians, killed only to supply their needs; but as communities developed, wildlife was harvested indiscriminately, with no thought for the future. The town markets were glutted with "game" that sold for a trifle.

By 1895, when the Board of Game Commissioners was established, black bears were rare in Pennsylvania; but even so, no laws were passed for their protection until 1905. At that time, a law was passed prohibiting the shooting of bears except during a specified hunting season—from October 1 to March 1. Pennsylvania was the first State to enact legislation for the protection of the black bear. The law included black bears on the list of protected game animals, provided for the killing of a bear if it was destroying personal property, and imposed a fifty dollar fine on anyone killing a bear out of season, or contrary to the legislation. The penalty was subsequently increased to one hundred dollars, and in 1949 it was raised again to two hundred dollars.

This was a step in the right direction, but the new legislation only prohibited shooting. It said nothing about the use of steel traps and deadfalls, which were not only cruel to the animal but dangerous to those tramping the woods. In 1909, the season was reduced

Three small black bear cubs, whose mother was killed by a trapper, were brought into Bill Geagan's newspaper office by the game warden at the left. Mr. Geagan and the society editor team up to feed one cub, and a printer, at the right, feeds another. Youngsters were taken to the State game farm for rearing, and were later taken to the deep woods and released.





to three months—from October 1 to January 1. Two years later, new legislation abolished the use of steel traps and deadfalls, as cruel and dangerous to both animal and human life.

By 1912, the black bear had considerably increased in Pennsylvania, and sportsmen were beginning to consider it a worth-while "game" animal. Accordingly, they demanded more protection for the black bear, and in 1915, legislation reduced the hunting season to only two months, limiting the kill to one bear per hunter. Also, it prohibited the use of pens and pitfalls. By 1917, the law still limited the bag to one bear per hunter, but it had established a bag limit of three to a hunting party.

The black bear has a number of vocal sounds to express its emotions—it growls when angry, coughs when threatening, and bawls to express rage or pain. Besides these sounds, there are several kinds of sniffs and whining calls.

This gave the State's bear population even more of a chance to increase, and by 1919 the animals had become so numerous, in some counties, that there were complaints of the destruction of sheep and beehives by bears. To cover such damage, the game commission set up a bear damage fund. Although bears do not ordinarily kill sheep, an occasional animal, perhaps because of a shortage of natural food, will become a killer, and must be destroyed.

The Pennsylvania Legislature, in 1921, enacted a law prohibiting the use of any ammunition except single bullets to kill these mammals, and reduced the season to a month and a half, and in 1925, another law was passed giving cubs under one year of age full protection at all times—a regulation that has been in force ever since. In 1935, a law was passed prohibiting the use of dogs in hunting bears.

It is difficult to make an estimate of the exact number of these animals that roam the rugged Pennsylvania mountains today; but in spite of the fact that there is still a hunting season for black bear, and that, indeed, the creatures may still be hunted even in some of the State parks of Pennsylvania, this shy, swift and elusive animal seems to be holding to the gains it has made since the turn of the century.



Bears, Business and Pulpwood

By BILL GEAGAN

IN SPITE of the persistent pleas of conservation workers and real sportsmen, and the strong supporting reports and recommendations of its wildlife biologists, the State of Maine still classifies the black bear as undesirable, and until 1957 placed a price on its head. The legislative representatives of those favoring this classification, and an all-year open season in the State's organized and unorganized territory, continue to hold sway in session after session of the legislature.

The animals—both adults and cubs of either sex—may be trapped or shot at any time, and in any numbers. And, in recent years, something new has been added to increase the uncontrolled slaughter; the profitable business of selling the carcasses to non-resident "sportsmen" at fancy prices. The boom came with the advent of the deep-freezer, along with the greatly expanded use of commercial cold storage plants for freezing carcasses.

In areas where bears are relatively numerous, they are taken in considerable numbers, mostly by huge, tooth-studded steel traps during the spring and summer. After animals are trapped, the carcasses are put in storage to await the arrival of the deer-hunting season, and the influx of cash customers from the big cities. A certain number of "sportsmen" would much rather return home with a bear than a deer, because the former are not as numerous as deer, are much more difficult to hunt down, and are generally rated by the sporting fraternity as "very ferocious." Such a trophy endows the bearer with a certain aura of prestige that is somehow unobtainable from the exhibition of a deer carcass. The trophies range from helpless little cubs to adult specimens of four and five hundred pounds, and the price may range up to one hundred dollars or more. The total yearly take by the bear-sellers is not known, but it is

thought to amount to a considerable sum, particularly in those years when cubs are plentiful.

The amount paid in bounties, in the past, and for property damage has run into the thousands of dollars. Such payments are not made by the Department of Inland Fisheries and Game, but by the Department of Agriculture, with money derived from the sale of dog licenses. And now, adding impetus to the cause of the anti-bear forces, comes one of America's great paper companies with the claim that bears are destroying many valuable fir and spruce trees on their vast holdings in the Maine wilderness.

In a report, the paper company stated that, during a survey of 230,000 acres of remote forest land in northern Maine, the company's forest engineers discovered an "alarming" amount of bear damage. The engineers went on to pinpoint the damage with an array of statistical information, all of which did not seem particularly impressive to Russell DeGarmo, chief of the Maine Fish and Game Department's Game Division. Mr. DeGarmo says, however, that a study of this matter will be made by his biologists.

"I recall having seen several fir trees in the vicinity of Musquacook Lake two winters ago on which the bark was missing for several inches at the base of the tree, yet I was unable to find any evidence where bear claws or teeth had been responsible. I do feel this is a matter on which we should do some checking," says Mr. DeGarmo. Veteran biologist Myron Smart of the Division, reporting from the vast northern Maine region mentioned by the paper company, says in a letter to DeGarmo; "Much of the so-called stripping of bark is the result of freezing and thawing during the winter months and no evidence of damage by bears can be seen on such trees."

During an extensive bear survey recently completed by biologist Howard E. Spencer, Jr., and his assistants, "marking trees" were found occasionally, but no great damage was found in any part of the territory studied. Never, in many years of wandering in Maine's big woods, have I, myself, found evidence of heavy tree damage by bears. And neither have the many trappers and woodsmen with whom I have discussed the subject.

The annual payments for damage done by bears from 1946 through 1953 ranged from a low of \$5700 to a high of \$15,000, and averaged in excess of \$10,000. During that period, a total of 6891 animals were presented for bounty, at a cost of \$98,195. The figure included the killing of livestock, mostly sheep, the trampling of oat and corn fields, the breaking of orchard trees, and raids on food-storage buildings.

In his survey report, biologist Spencer says that a lone male bear usually is responsible for the killing of livestock in any single locality, and that when that animal is removed the killing ordinarily stops. Furthermore, says Mr. Spencer, nobody is sure why bears maul the bark of trees. Some authorities believe the "marking trees" are used by large bears to show their great height, while others feel that such

bark-clawing is done by playful cubs. There are also those who insist that debarking is caused by the animals sharpening their claws in the manner of cats, and who also believe that the bark of such trees is a part of the diet before, and immediately after, hibernation. Perhaps the answer to the question might be a combination of the several theories. At any rate, up to the present time, the bark-clawing seems to be something that is done by bears to annoy paper companies, and make biologists curious.

The survey by Mr. Spencer further reveals that all substantial bear damage is confined to a limited belt extending east and north across Maine, and constitutes only a portion of the State's bear range. The reasons for this are obvious when land-use patterns are considered. The bear damage belt coincides with the transitional belt between the southern agricultural region and the northern timberlands. South of this belt, bears become progressively less numerous, and northward, in the wilderness area, there is little opportunity for the animals to attack livestock or cause other damage.

The bear population in Maine is far smaller than that of most indigenous wild animals. Even in heavily wooded regions, the favorite domain, the population is not great. An inventory during the past few years revealed that the bear population consists of not more than five to seven thousand animals, and is just about holding its own. This is in sharp contrast to the deer population, which has been estimated at 200,000, and is increasing steadily. Crop damage in Maine by deer each year is tremendous, yet no payment is now made for that; rated as top-flight "game" animals, the deer herd is carefully protected.

Exactly what part the black bear plays in Nature's balanced arrangement is not wholly known; but it is certain that there is such a part. The Maine Fish and Game Department's biologists blended their voices with those of conservationists and true sportsmen to have the bounty repealed. However, the bear is still classed as a predator, while it should be classified as a game animal, and protected as such.



An adult black bear is caught by the camera while foraging in the dump of a sporting camp.



The Mixed-up Tree

By

RUTH H. DUDLEY

ONCE OF the great conifers of America has been chosen by the people of Oregon to represent them as a State tree. It is the towering Douglas fir, a tree with an equally towering botanical name, *Pseudotsuga taxifolia*, which, translated into everyday language, means "the false hemlock with a yew-like leaf."

The Douglas fir hardly can be classed with any of the other conifers. It is neither a true fir, spruce or hemlock, although it shares some of the qualities of each of these trees—and in addition, has others that are peculiarly its own. It is called the Douglas fir because its brownish-gray trunk is deeply furrowed, like the trunk of a fir tree. But if you examine the cones of the fir, you will find that they stand straight up on the branches, while those of the Douglas fir hang down.

Sometimes you will hear this tree referred to as the Douglas spruce. The cones hang down like those of the spruce, the smaller branches droop just as gracefully, and its needles grow all around the stem. But the needles of the Douglas fir have tiny thread-like stems, like the needles of the hemlock. The cones, however, are not like those of the hemlock. And so it goes with this tree, difficult to class popularly.

The cones of the Douglas fir are brown in color, from two to four inches long, and growing out from each scale on the cone is a little three-pointed leaf, or bract. Each of these soft, green bracts stretches out beyond the scale to which it is fastened, giving the cone a pretty fringed or feathered appearance.

Next to the *Sequoia*, the giant "living fossil" of the coastal and mountain areas of California and Oregon,



Photograph by

United States Forest Service

Wherever there is heavy construction like bridgework and shipbuilding, you are likely to find timbers sawed from the Douglas fir.

the Douglas fir is the largest forest tree of the United States. In the rain forests of the Pacific Northwest, the Douglas fir, in company with other trees of the region, clothes the ground with such an array of plant life as to be well-nigh unbelievable. It is also at home in the other western States, as well as in Canada and Mexico. The Douglas fir grows tall, straight and close together in the forest. The trunks often stretch up a hundred feet or more before sending out their first branches, and the total height of a well-grown specimen may range from a hundred and eighty to two hundred and fifty feet, with a trunk from four to eight feet in diameter. When grown by itself, as an ornamental, the branches start out low on the trunk, because of the greater total amount of light available to the tree.

Perhaps you may wonder how this magnificent tree acquired the first part of its name. It was David Douglas, the Scottish traveler, who saw the tree on the shores of America in 1825, and who took its

seeds back to Europe in hope of growing it there; and for him it is named.

Like the white pine, the timber of this tree is light, soft and strong; and therefore is valued highly. Wherever great timbers are required, you will find the wood of the remarkable Douglas fir, and it is fortunate that the need for conservation of the Douglas fir has been recognized, so that it will not disappear like the choice forests of the eastern white pine.





In this illustration the lotus, emblem of summer, is shown in bud, in full flower, and with seed pods.

Chinese dyeing methods owe

A Debt to Nature

By MABEL IRENE HUGGINS

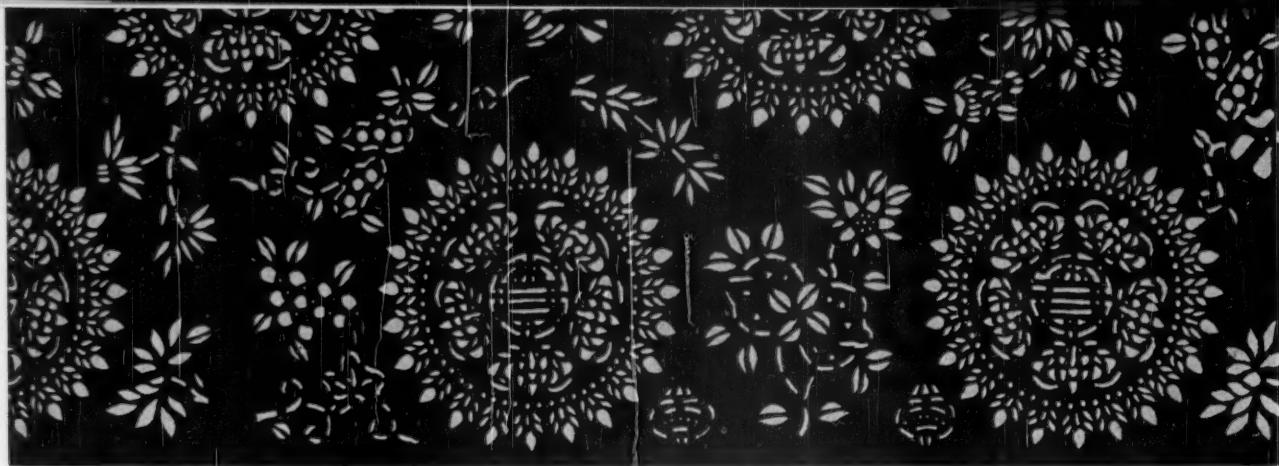
USUALLY, when we think of Chinese textiles in association with Nature, we conjure up a mental picture of brocaded satins, with fabulous bamboo and plum blossom designs, or cut velvets with peony and butterfly patterns, or *k'o-ssu* with orchids and chrysanthemums woven into its silken folds. But the opposites of these luxury fabrics may be found, and without any difficulty whatever. Throughout China, one of the familiar sights is the coarse cotton material which, at first sight, seems to exhibit almost a catalog of Nature's flora, and some fauna, in its stencilled decorations.

That the makers of these designs have drawn their inspirations from Nature is indicative of the fact that the Chinese, regardless of their economic levels, are close to Nature. The laboring boatman on the Grand Canal loves his one potted plant on the narrow deck of his houseboat; his wife finds appeal in the flowered cloth, with which she will make comforters to warm them through cold nights.

Before this coarse cotton material reaches the counter of the cloth shop or the booth in a market, it must go through several interesting processes. The desired stencil of oiled paper is placed upon the cloth, and a thin lime mortar is carefully brushed over it. The stencil



Strong, scaly fish have been introduced into this "cracked ice" pattern in which plum blossoms have been superimposed on the floes of ice. A few sprigs of bamboo also may be noted. The plum blossom is a "flower of the four seasons," and is the symbol for winter.



paper, usually about twenty-eight inches long, is then moved to the next section of cloth, and the process is repeated until the pattern has been applied to the entire length of cloth. Naturally, great care must be taken in order to avoid any smearing. The lime is then allowed to dry thoroughly.

After this comes the dyeing in vats that sometimes contain light blue, brown, or green dye, but most usually a dye of indigo blue. As may be readily seen, that portion of the fabric that is encrusted with lime "resists" the dye, and does not absorb the color; hence, the method is termed "resist dyeing." In this step, the dyers must avoid breaking the lime, so no wringing of the cloth can be tolerated. When the cloth is taken from the vat, it is allowed to drip, and then spread out to dry.

After this drying period the workers use long, fairly sharp iron knives, and scrape the lime from the surface of the cloth before the final calendering of the fabric takes place. Often the purchaser of the cloth finds that numerous bits of lime still cling to the undyed pattern, especially along the selvages.

A study of the designs is rewarding. It is soon evident that not any or every flower or plant has been represented; not every member of the animal kingdom has been depicted. Symbolism plays an important part. As in an earlier day our ancestors had a language of flowers—rue for repentance, pansies for thoughts, rosemary for fidelity—so it is that the subjects of these Chinese designs are, to a large extent, emblematic.

We do not look long before we find the "flowers of the four seasons." This group is made up of the tree peony for spring, the lotus for summer, the chrysanthemum for autumn, and the plum for winter. The peony, symbol of spring, is also the emblem of riches. We see peonies depicted in elegant gardens with fine ladies, and also we find these gorgeous flowers in the company of long-tailed birds—the pheasant, the phoenix, or even the rooster—and it is in this combination that we most frequently see them in stencilled designs.

The lotus, like the peony, is to be found in Chinese art in many media. It is represented in bud and flower, and also in seed-pod, and it is of great religious significance, both to the Buddhists and the Taoists. Rising, as it does, unspotted by the mire from which it grows, it becomes a symbol of purity. Therefore, it seems fitting

Above, five-bat medallions make a striking decoration, surrounded by the "three fruits" and various sprays. Below, the Chinese painter skillfully depicts long, graceful orchid leaves.

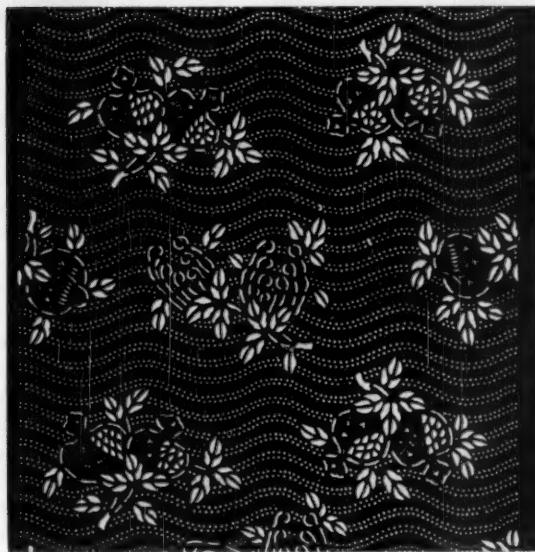


for figures of Buddha to be seated upon lotus blossoms. A teapot may be fashioned in the form of a lotus. Or, an artist may paint a scroll upon which lotus blossoms will bloom for succeeding generations, to delight the eyes of all beholders. On luxurious palace or temple hangings, the sacred lotus pattern adds beauty. But this flower, with its universal quality, seems just as appropriate when used as the decorative motif on coarse cotton fabrics.

The chrysanthemum of autumn has long been associated with poetry. The poet T'ao Ch'ien (A.D. 365-427) preferred a quiet life of chrysanthemum growing to official position, and since that day the chrysanthemum and T'ao Ch'ien are practically synonymous. The cultivation of chrysanthemums may be a profitable business, as is suggested by the vast array of plants that crowd an autumn flower market. Or, chrysanthemum growing may be the hobby of artists. And certainly, in North China, the chrysanthemum invades the kitchen. Credit must be given to the Chinese chef for his



Above, butterflies crowd all the spaces in this floral design, while below, the "three fruits"—the peach, the pomegranate, and the Buddha's hand—are readily identified in the pattern.



culinary imagination when he tosses a handful of curling white chrysanthemum petals into his kettle, and produces steaming chrysanthemum soup, an exotic concoction unheard of by most American cooks.

The plum, emblem of winter, is first to bloom on the calendar of the year's flowers. It stands first, also, in the affection of the people. It has a part in what is known as the "cracked ice" pattern. Here, ice floes are represented as floating downstream, while plum blossoms have fallen on them and are being carried along. Sometimes fish may be added to this design to give additional reality to the river scene.

The plum and the chrysanthemum not only are found linked with the peony and the lotus, but at times also are in the company of the bamboo and the orchid. This quartet has for centuries been beloved of painters. It will be noted that the orchid is not the great opulent dowager blossom that we see in corsages, but a gentle little flower of ineffable fragrance, and with foliage that requires the most expert skill of a painter. In the stencil designs

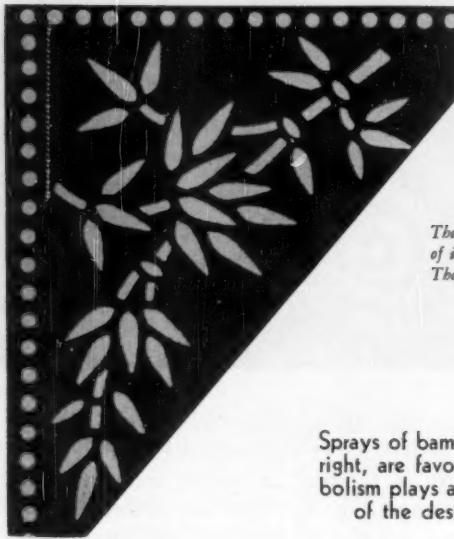
two small orchids may be placed face to face, forming a decorative medallion. Or an attractive border is evolved with a sprig of bamboo, an orchid, sprays of plum blossoms, another orchid, and a chrysanthemum—and then repeated. Another effective, although simple, border employs nothing more than individual orchids alternating with the endless knot pattern.

Another group that seems ever-popular is the trio known as the "three fruits"—the peach, the pomegranate, and the Buddha's hand. These fruits represent the most desired blessings of life, inasmuch as they symbolize many years, many descendants, and many official promotions. As such, they are called the "three abundances," and we can easily understand the suitability of using these emblems on comforters, valances, bed curtains, and other household furnishings. Sometimes, when the "three fruits" occupy three of the corners in a square or rectangular space, the fourth place is filled with a pumpkin-like melon of unknown significance.

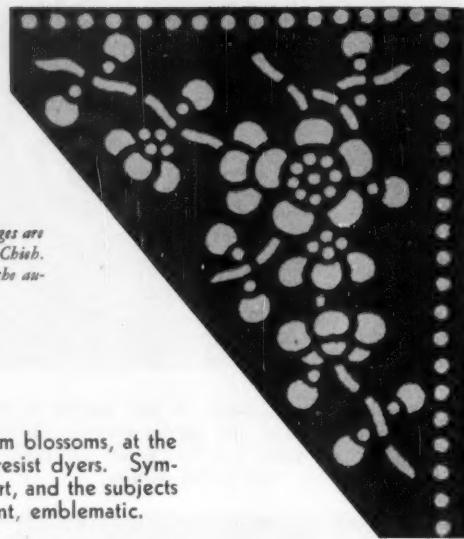
A favorite art motif with the Chinese is the double gourd that is associated with certain deities as having magical powers. It is one of the most common longevity symbols. Teapots, wine sippers, snuff bottles, and many other objects are made in this form. The gourds, themselves, are often used as cricket cages. We are not surprised, then, to find double gourds with a bit of vine and leaf in these stencilled decorations.

A plant for good luck is the "water fairy flower," known to the Western world as the Chinese sacred lily. It is thought to be especially auspicious if the flowers open to welcome the New Year, and whole plants—flowers, leaves, bulbs, and roots—are cut in the stencil pattern with amazing realism.

An ancient design that has been adapted to stencils is the grape and squirrel pattern. This combination of plant and animal life was used long ago on Tang dynasty bronze mirrors. The grape is known to have been introduced into China from the West by Wu-ti, more than a hundred years before Christ. This grape and squirrel design has been used in many ways. On one occasion, a great collection of clocks was exhibited in the Imperial palaces in Peking, and there was one with an intricate grape-arbor, fashioned from jade and amethysts. Upon the striking of the hour, little squirrels



The illustrations on the preceding pages are of items in the collection of Lin Han-Chieh. The patterns on this page are from the author's collection.



Sprays of bamboo, at the left, and plum blossoms, at the right, are favorite designs of Chinese resist dyers. Symbolism plays an important part in this art, and the subjects of the designs are, to a large extent, emblematic.

chased around in the grape vines in a most realistic manner, a proof of the imaginative ability of the Chinese craftsman and his skill in execution.

As in Nature, where there are flowers there are likely to be butterflies; so the stencil designers have used butterflies generously in their floral patterns. Sometimes they are small and conventionalized; sometimes large and ornate, with a marvelous display of waving swallowtails and curving antennae.

Designs made of peonies accompanied by long-tailed birds have already been mentioned, and just as traditional is the combination of lotus and mandarin ducks. These beautifully colored birds are a symbol of conjugal fidelity and married happiness, and so make a suitable decoration for household furnishings. Another bird that is constantly seen in these stencilled designs is the crane, one of the well-known long-life symbols. The crane is always in the company of the deer, another longevity emblem. In one example the spots on the deer are plum blossoms, and in the deer's mouth is a specimen of the long-life woody fungus, the entire composition carrying out a unified idea.

Among the varying types of animal life that are used on these cotton fabrics, fish may be often noted. Sometimes they are ruffle-finned, pop-eyed goldfish, but just as often they are of a plain, carp-like appearance. If they are of the goldfish sort, they are usually with lotus, or other plants of an aquatic nature. In any case, the fish is a symbol of riches, due to a pun on the Chinese word.

In the Yellow River, there are famous rapids known as

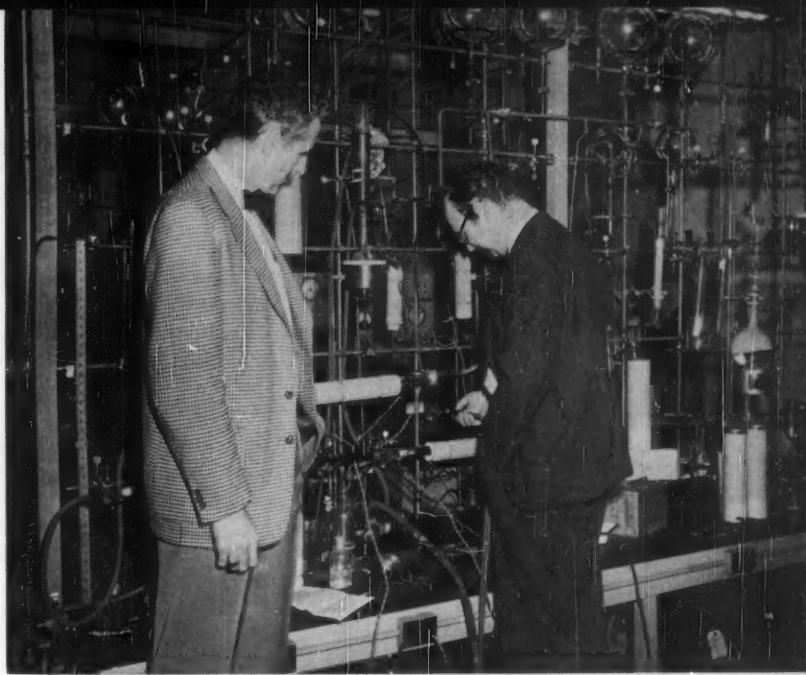
the *Lung Men*, the "Dragon Gate," over which a certain kind of fish attempts to ascend. If successful, the fish is changed into a dragon, so folk believe. The struggle of the fish against the current was greatly admired, especially by those who were trying to pass the old-style classical examinations that led to official positions. Hence the fish became the emblem of literary excellence. One of the Eight Auspicious Signs on the sole of Buddha's foot was a pair of fish. This symbol also signifies married happiness, and is, therefore, a lucky pattern, to be used on household fabrics.

An extremely popular design is one in which the bat is featured. The bat may be called a "flying rat," but is not held in disrepute, as it is in some parts of the world. Rather, it is the symbol for happiness. This is because the Chinese word for bat—*fu*—has the same sound as the word meaning "happiness." One of the favorite art motifs is a pictorial rebus made up of five bats surrounding the Chinese character for long life, signifying the five happinesses that are desired in life—health, love of virtue, wealth, old age, and a natural death. Sometimes the bat design is so ornate that it is difficult to distinguish it from a butterfly.

The lion often appears in these designs, but it is possible that it is not a real lion, but rather a creature from a mythical realm, perhaps from the same world in which the dragon and the phoenix dwell. At any rate, lions with curly manes and short bushy tails add life wherever they are introduced, and serve to enhance the pleasure offered to millions of Chinese women and girls by the designs that are borrowed from Nature.



Dr. Hans Suess, at the right, who is a physical chemist with the U. S. Geological Survey, demonstrates to archeologist Dr. John M. Corbett of the National Park Service a modification of the Libby method of dating archeological and pre-historic plant and animal remains, based on measurements of the natural radioactivity of carbon 14.



U. S. GEOLOGICAL SURVEY PHOTOGRAPH

Atoms that Punch the Time-Clock

By MARJORIE MATTHAEI

WE HAVE all been fairly well exposed, by this time, to awe-inspiring stories of the use of atomic energy, both as a destructive weapon and as a source of peace-time power. But, in addition to its martial and commercial potentials, the study of atomic energy has also recently developed a valuable research tool for students of natural history. Many scientists agree that the discovery of the carbon 14 method of dating the events of antiquity may make possible the greatest single advance in historical science ever known. A whole new calendar of the history of our world may well be written.

Not many years ago, atomic scientists discovered that atmospheric carbon dioxide contains a small percentage of radioactive carbon—carbon 14—formed when cosmic ray particles bombard the nitrogen of the air. The rate of this formation has remained constant for at least the past 25,000 years. The unstable carbon 14 atoms are taken in by all living creatures, and as long as the plant or animal is alive, its loss of carbon 14 equals its intake, so that there is a constant amount in each organism. When the organism dies, carbon 14 absorption ceases. This radioactive carbon begins to reconvert to nitrogen by emitting an electron, a process whose progress can be measured by special Geiger counters. Half of the carbon 14 has disappeared in the first 5568 years, and in another 5568 years half of what is left is gone; and after a period of some 33,000 years, only about one percent is left. Therefore, the age of a given sample can

be determined by counting the electrons given off, and measuring their rate against that of a sample of known age.

Up to now, the word "time" has been a rather relative one in estimating the progress of animal and vegetable development. The charred bones of ancient animals, or the charcoal from some long-forgotten campfire could not, with any degree of accuracy, be placed in time, but only related in sequence to the layers above or below. The relics of ancient man found in America could be compared with those from Europe and Asia, and relative times guessed at. But there was no positive way of knowing whether cultures that seemed contemporary in different parts of the world really were so.

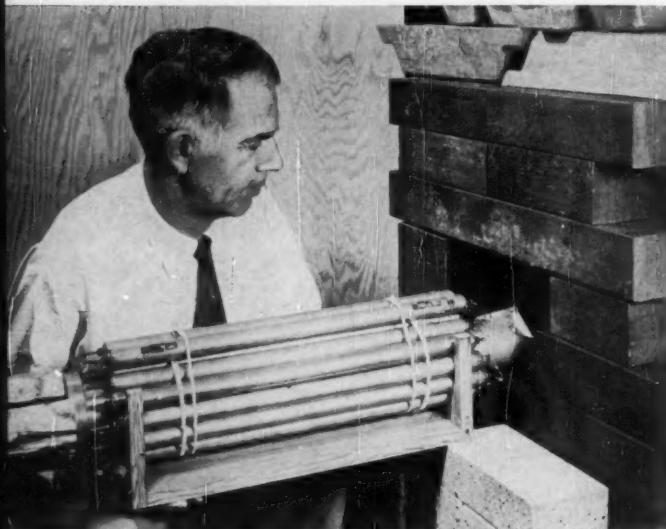
Carbon 14 is changing this uncertain picture. Charcoal from a cooking fire of 43,000 years ago, in Syria, shows that men were present there, even at that distant date. Were there nomads roaming the hills of our own country then? If relics can be found, carbon 14 will date them. A pair of fiber sandals left in a cave in Oregon assure their owner and the people of his day a place on the time chart of the world at 7000 B.C. Did the people of northern Europe enjoy a more developed culture at that time? Carbon 14 will help find the answer.

"In its simplest forms, the major significance of the radiocarbon method of dating is that the resulting chronology is world-wide in scope; dates determined in one place may be compared with those from any other,"

says Frederick Johnson of the Robert S. Peabody Foundation for Archaeology, of Phillips Academy in Andover, Massachusetts. Mr. Johnson has worked closely with Dr. Willard F. Libby, now of the Atomic Energy Commission, who pioneered the new method of dating.

"...A correlation between the Old World and the New World is rapidly developing," Mr. Johnson continues. "This was never possible before, even though inferences and comparisons of sequences could be made."

Not only will carbon 14 correlate samples from around the world, but it will make possible direct comparisons between time schedules in the fields of archeology, geology, pollen analysis, and other related fields. When there is a difference in time between geological and



Professor H. R. Crane, of the University of Michigan physics department, inserts a carbon 14 counter into the massive iron shield that prevents contamination of the tested item by cosmic radiation. This work is being sponsored by the Michigan Memorial-Phoenix Project.

archeological evidence, for example, carbon 14 dating will help to adjust it. The new method greatly increases accuracy, and will save much time previously spent in placing samples in historical perspective. Now the scientists will have more time to make the deductions necessary to write a truer calendar of the world.

The Pleistocene period has always been of great human interest, for it was during this period that traces of man first appear. Many new plants and animals developed. As scientists write more of the calendar for this period of earth-history, they not only learn more about man and his development, but also get a notion of how long it takes to develop new species among plants and animals.

When did the last glacial ice move down over the northern part of the United States? Dates obtained by Dr. Libby from Two Creeks Forest Bed, in Wisconsin, indicate that the Mankato advance came about 10,000 years ago—much later than previous geological esti-

mates had assigned to it. Dates from northern Europe substantiate this later time, and added proof comes from the dating of a cedar forest in Bermuda that was submerged by the rising waters of the sea as glacial ice melted.

Carbon 14 dating offers fascinating possibilities in other fields, also. The scheduling of various cultural periods, and the circulation of the deeper currents of the oceans might be cited as two of the widely differing problems that the new research tool will help to solve.

Man probably came to America more than 23,000 years ago, trudging over the rough ice of the area that is now Bering Strait. As he moved south, he left a few remains of his passing—bones of the animals killed for food, or charcoal from a campfire. As these remains are found, they can be dated, and we will know exactly when man came to the New World. Remains found in island caves off California's coast were recently subjected to carbon 14 test, may indicate man's presence there 35,000 years ago.

For the most part, carbon 14 dates have substantiated previous archeological and geological theories, with changes only in details. But there must be major changes in ideas about dates for the classic civilizations in Middle America and Peru. This period seems to have ended about 650 A.D., substantially earlier than had been supposed, leaving a time gap of 250 years in the culture schedules. A formative culture was being developed in Middle America as early as 1500 B.C. The cultivation of maize, which changed the habits of nomad people toward community life, commenced much earlier there than in Peru. It now appears that pottery-making, the culture of maize, and temple-mound construction developed in Mexico, and were taken into Peru from about 1000 to 600 B.C.

Little has been known of the circulation of deep oceanic waters of the earth. Scientists have been certain that the waters *did* circulate, and that knowledge of their movements would be important in many fields of study, including that of weather forecasting. But the water in the deeps of oceans moves too slowly to measure directly, and carbon 14 may be the tool that will unlock this "deep secret." Carbon dioxide, containing the carbon 14 atoms, is absorbed in surface water in the Arctic. The cold surface water continually sinks to the bottom, and moves toward the equator. Now the carbon 14 content can be measured, and the time calculated since it was absorbed at the surface. Samples are obtained by dropping two-hundred-gallon open tanks two or three miles down into the ocean, filling and closing them, then bringing them back to the surface for condensing and testing; and from dates so far obtained it appears that the time of circulation from Arctic to equator will be measured by a span of time that will be at least thousands of years.

Contamination and wrong classification of samples are the two greatest threats to the accuracy of any of these tests. Tiny hidden rootlets (*continued on page 106*)

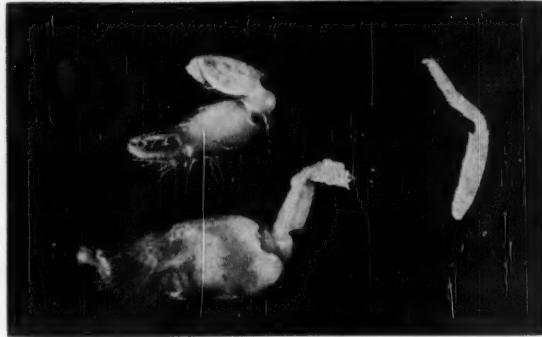
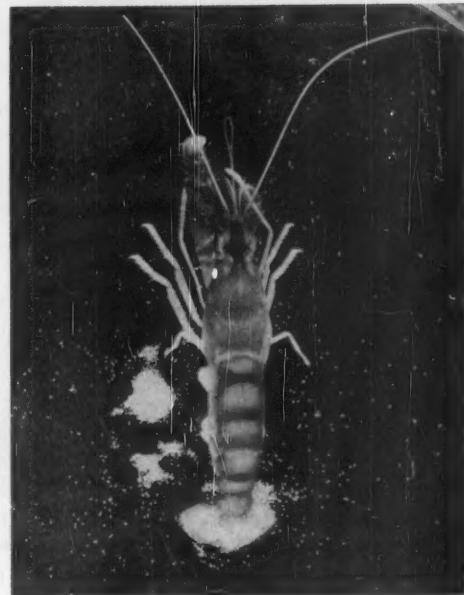
Sharpshooter of the Tidepools

By ROBERT GIVEN

Photographs by the Author

Illustrated below is the large claw—the "pistol" hand—of *Crangon*. Also shown are the other large claw, and a walking leg.

In the author's aquarium is a pistol shrimp that has lived there for about a year, and who "rules the aquarium with an iron claw."



WHEN THE tide starts to ebb along the California coast, it signals a bustle of activity. As the higher portions of the rocky shore are exposed, thousands of tiny barnacles will pull in their feet and close their doors, before the sun and air dry up the precious moisture that will carry them through to the next high tide. The little black periwinkles press close to the rocks, and secrete a thin, mucous seal around the edge of their shells to await the return of the water.

As the tide continues to recede, pools are formed in the rocky places. Some of these will hold water, like a basin, and may be several feet deep. Small fish, flowery anemones and spiny sea urchins can always be found here. The lucky observer may see a baby octopus peer out from under a rock, then jet-propel himself to a safer vantage point. Many of these pools will continue to drain down to a few inches of water, and the inhabitants are forced into the tiny puddles formed between rocks, and in old shells.

This low water marks the opening of the hunting season for our tidepool marksman, *Crangon*, the pistol shrimp, who is lightning fast on the draw, and a dead

shot. Sitting at the entrance to its burrow, in the sand or mud of the small tidepools, the shrimp will wave its long antennae, searching the water for the next meal. A small fish or worm may swim by, and the sensitive feelers detect the movement. Quickly it creeps out of the burrow and works into range. Then it cocks back the hammer on the gun-hand, pulls the trigger, and the hammer falls with a loud snap! There is no blood shed, for the fish was not actually touched. It was the concussion, or shock wave, from the blow that stunned the fish. The shrimp then pulls it into the burrow, and he and his mate dine. When they are through, the waste is pushed out, and the burrow made spotless again, for they are scrupulous housekeepers.

Crangon is an inconspicuous little fellow, and although noisy and energetic, it is seldom seen. In size, it will range from one to two inches, fully grown, and is well camouflaged with a greenish body and mottled brownish-green *chelae*, or claw-hands. One of these hands, either the right or the left, is greatly enlarged, and possesses a finger that can be pulled back to a ninety-degree angle, much as the hammer of a gun might be cocked. The inside edges of the finger may be bright orange-red, and this color may serve as a lure for small fish.

When the prey is sighted, a trigger device in the joint of the cocked hand releases the finger and flips it downward, striking the other part of the large hand with the stunning "snap!" One has only to have this happen while holding the shrimp, or to hear the sound, like splitting glass, in the aquarium to know the force of the blow. And the shock waves are more effective in water than in air, as children sometimes painfully learn by knocking rocks together underwater. These shrimps have actually broken thin glass jars, and aquarium walls that have been weakened by (continued on page 106)



After a syrup-making experiment, the plane tree was sacrificed without regret.

FEW OF THE internal phenomena of plant life are more easily demonstrated than the rising of maple sap in the spring. Prehistoric Indians knew about it; their knowledge was passed on to white settlers, and later to botanists, who still puzzle over some of the physical details involved. Trees—most of them, at least—store starch in certain portions of their wood. In preparation for new growth and new foliage, some of this starch is turned to sugar, and this, in solution, is transferred to points of developing need. Maples, especially the hard or sugar maple, resemble Emerson's mouse-trap so much that little attention is paid to the usually less profuse and sugary streams that pass upward in other woody plants before the leaves unfold. It was said, in rural New England, that syrup made from butternut sap had medicinal attributes—but the properties ascribed to it were such as to discourage youthful experimentation. Winter-cut stumps and trees wounded in spring often show sap-flow; on white birch stumps, for example, a pinkish scum develops, whose color is attributed to myriad microorganisms akin to yeasts that flourish in it.

Sap flow reaches its commercial maximum in maple trees alternately chilled below freezing at night and warmed by daytime sun. Thus, it is not conspicuous in warm climates such as that of interior California, where spring freezes are slight or lacking. Nevertheless, under "unusual" conditions of California weather, wounded branches of shade-tree maples sometimes dangle droplets and even icicles with a slightly sweetish flavor, suggestive of Vermont or Ontario.

Maples are not likely to thrive in hot, dry situations, and not many are planted in California. Where maples might be used in streets and parks of Ohio or Michigan, California and other rather warm States often use the London plane. The shape of its leaves is quite maple-like. Botanists call the tree *Platanus acerifolia*, the maple-leaved plane. A Vermonter, passing down a street lined with it, might think he was being shaded by some new sort of maple with ghostly grey-green off-white bark, but soon would notice, in spring, the spherical tassels of flowers, or later the balls of seeds, that would tell him this maple-leaved tree is closely

Sap Flows from the Plane Tree

By E. E. STANFORD

Photograph by the Author

related to the eastern American buttonball, or American sycamore. The cellular structure of the wood is in some respects maple-like, with large starch-storing regions. Leaf and wood characters do not indicate any close kinship between true maples and the maple-leaved plane. The latter tree is a variant of the Oriental plane of Greek writers, a tree venerated by the ancients for its vast size and wonderful shade, in groves of which Plato and other Greek sages walked and talked, the plane tree of Xerxes and Handel's "Largo."

These trees grow rapidly, present a tremendous spread of foliage, and under suitable conditions may display a maple-like volume of sap flow. This came to my attention in January of 1957, on the College of the Pacific campus in Stockton, California. A building project required the removal of several plane trees that in thirty years from planting had reached a diameter of about eighteen inches, and a broad-spreading height of more than sixty feet. Perhaps to comply with a lumbering tradition from higher altitudes, a workman walked along the row one night and gashed the trees that were to be removed. A sharp frost came that night; the next morning the axe-marks were "bleeding" profusely.

The moment seemed propitious for a class demonstration that would be more nearly an "experiment" than most of those written down in botanical laboratory manuals. Sugar-making paraphernalia, of a sort with which I had been familiar in earlier days, is not to be found on a California campus. A chain-saw operator hired at eighteen dollars an hour was in the offing, and time was of the essence. We assembled some block-tin pipe, left over from a water still installation, an auger bit of slightly over-ample caliber, a copper can made for sterilizing purposes, and an eight-penny nail. These were manipulated in something like Vermont fashion, and the woodsmen persuaded to "spare that tree" until what would happen should happen.

I think—as a Californian even by adoption should think—that the plane tree "ran" faster than an average sugar maple, and hopes rose with the level of liquid in the can. In an hour, about a quart of sap had collected. It was water-clear; and save for a slight bitterness and lack of chlorine flavor, it com- (continued on page 106)

Butterball was accustomed to fill himself with food just before dark, and would sleep soundly until there was a stir in the house the next morning.



Around the Clock with "Butterball"

By HUGH M. HALLIDAY

Photographs by the Author

EVERY TIME I thumb through my file of wildlife pictures, I come upon my prints of Butterball, the woodchuck, and I pause, keenly reminded of the words I wrote for the little book, *Wildlife Friends*, that was published back in 1954 by Thomas Allen, Limited, of Toronto, Ontario.

"Somewhere in an embankment of a wooded ravine in the city of Toronto," I said, "I have a friend—a groundhog known as Butterball. Often I wonder if he thinks of me as much as I think of him, for this lovable little fellow dug his burrow deep into my heart. I do not know where he is living now. He gave us his friendship for a considerable period. Then the instinct of his kind triumphed and he left us.

"I had always thought of a woodchuck, or groundhog, as a rather stupid animal, living a life of fear, afraid to venture far from its burrow, with an instinct that had only one response, that of diving for safety. Butterball, by his colorful personality, warm affection, long memory, and marked ability to distinguish friends from strangers showed me that I had underestimated him.

"One of the interesting things about Butterball was the speed with which he grew, not only in stature, but in wisdom. For some days after he came to us, he was a baby. We fed him cow's milk with a medicine dropper, and he thrived on both our food and care. Then, suddenly, he became a 'boy,' full of mischief, adventure, and

Few woodchucks ever were more thoroughly spoiled than this one. Whenever opportunity offered, Butterball climbed to the author's knee. If put back down again, the little mammal became all the more determined.

investigation—willing, it would seem, to try anything.

"The children of the neighborhood soon learned of his presence. They named him 'Butterball,' apparently because of the way he filled himself with food."

So here is an invitation to go through my file of pictures with me, and to meet Butterball as we knew him!





To the young woodchuck, the contents of a milk bottle were exciting and delicious. To most baby wild animals, cow's milk as a food apparently is too acid, but it was just the thing for this fellow.

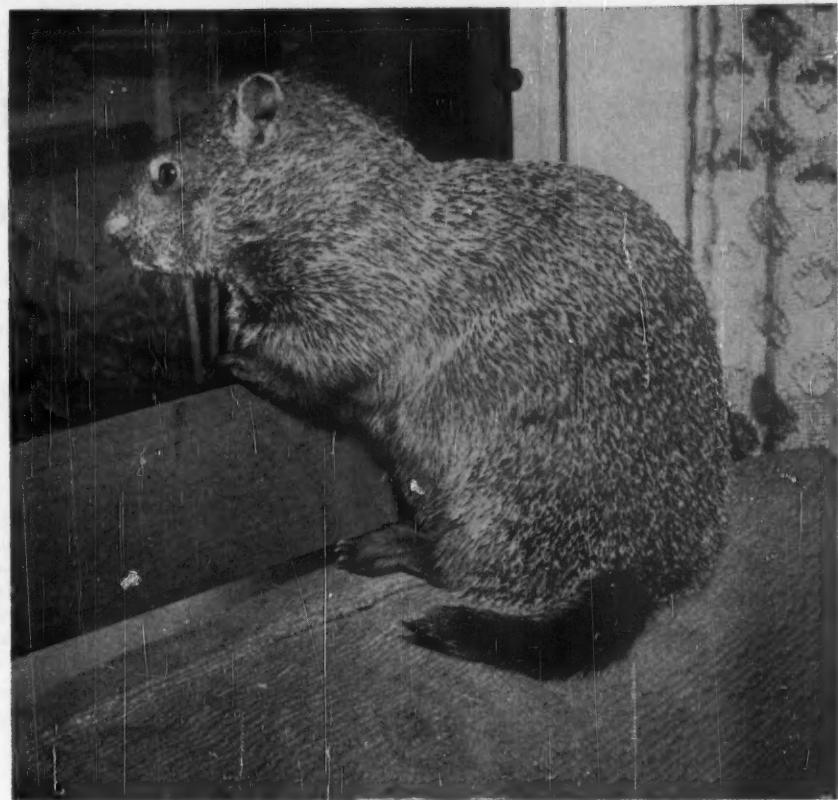


Butterball did not subscribe to the notion that woodchucks should be strictly vegetarian. One way of starting a flurry of excitement was to offer the animal a sweet biscuit, then try to take it away.



As a youngster, Butterball had some difficulty in differentiating between fingers and food. He never lost his inclination to play, and was remarkably quick on his feet.

Now and then Butterball whiled away his time inspecting the outside world through the window, sometimes in company with a cat with whom he had become acquainted.



Cherries became part of the menu after the woodchuck crawled into the wastebasket one day to retrieve the cherry-pits that had been thrown there. The pits were cracked and scattered freely about the floor.



At first, the young woodchuck was fed with a medicine-dropper; but, as he grew older, his signal for food was a dash towards the refrigerator. The first course—milk—was usually followed by clover leaves.

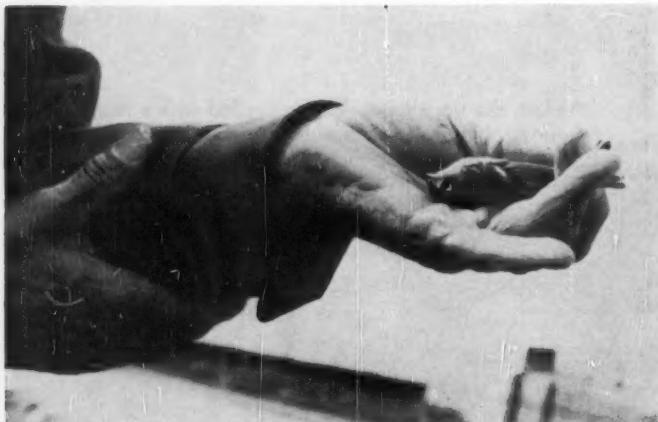




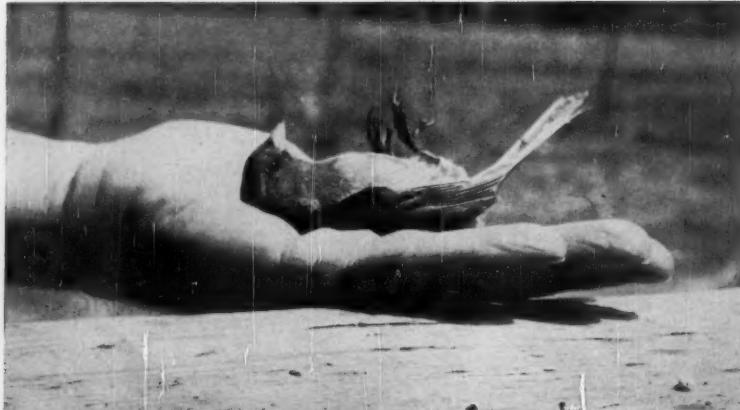
Bird Banders Take to the Net

By RUSSELL J. RUTTER

Nets are woven of black silk thread or nylon thread, and are suspended vertically between slender poles. An ideal location is a partly shaded passage through mixed woods, where the trees are not too high. During the fall migration of 1957, the net shown here, which is forty feet long and is not covering any particular flyway, captured more than 200 birds of twenty-eight species.



Only the size of its captor's thumb, this kinglet, which has just had a band placed on its leg, is about to be given its freedom. Its small size presents the only difficulty in handling it.



After banding, birds often will lie in the hand, as this junco is doing, apparently quite disoriented by their upside-down position. Sometimes they have to be tossed lightly into the air to make them fly.

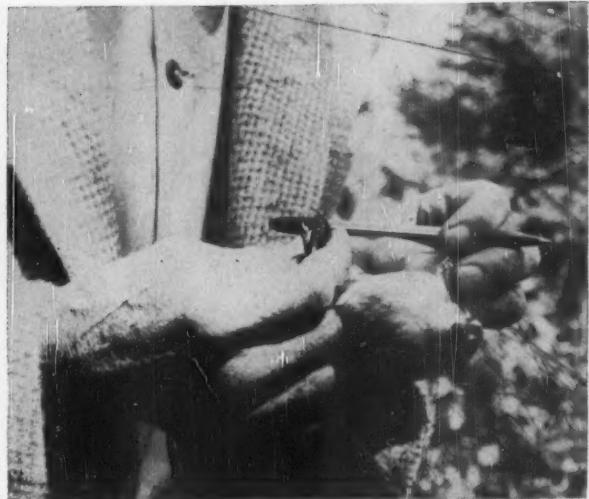
"Surely the net is spread in vain in the sight of any bird," is the seventeenth verse of the first chapter of the *Book of Proverbs*, showing that the use of nets for catching birds is about as old as human history. In that distant era, birds were netted only for food, or perhaps to be held captive for their songs; and centuries passed before men began to inquire into bird behavior. Many more centuries went by before the first inquiring ornithologist tied red thread on the legs of swallows, in an attempt to learn whether they migrated, or hibernated in winter, and it was late in the nineteenth century before anything like systematic bird-banding was undertaken in Europe. The practice did not become general in America until as recently as the 1920's, but, since then, it has grown to be an important branch of bird study over the whole continent.

Over the years, banders have devised an endless variety of traps, mostly of wire mesh, and hundreds of thousands of birds have been caught and banded, giving us a vast store of knowledge about their travels. But ground-feeding birds have always been in the majority, as wire traps never have provided a completely satisfactory method of taking large numbers of such arboreal species as wood warblers. Since the adoption of nets, about five years ago, the picture has changed, and while traps always will be better for some kinds of birds, the number of warblers and birds of similar habit that are being banded is soaring rapidly.

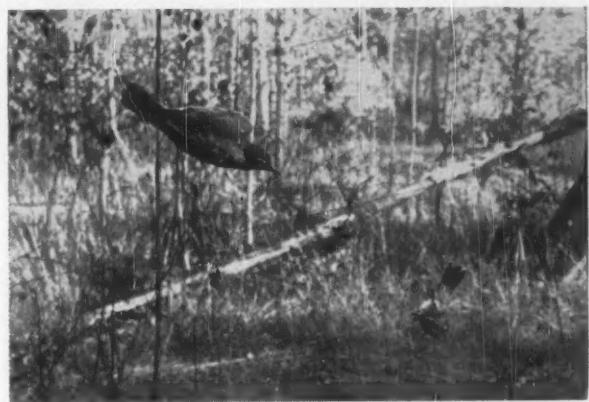
Two or three nets may be carried in the pockets, and set up anywhere without adding noticeably to weight and bulk of equipment. But while it is a more simple matter to erect a net and catch birds in it than to construct an efficient trap, it requires more finesse to operate one without injury to the birds. That is one reason why net operation is not covered by the ordinary banding permit; permission to take birds in this way is granted only to carefully selected banders, and with proper handling, injuries to birds, a rare thing in bird-banding at any time, will be fewer with nets than with traps.



The ruby-crowned kinglet is an ideal prisoner. So small that it often passes through a one-inch mesh, it shows no fear whatever, and is so unresisting and cooperative in the hand that it is no trouble to remove it from the net.

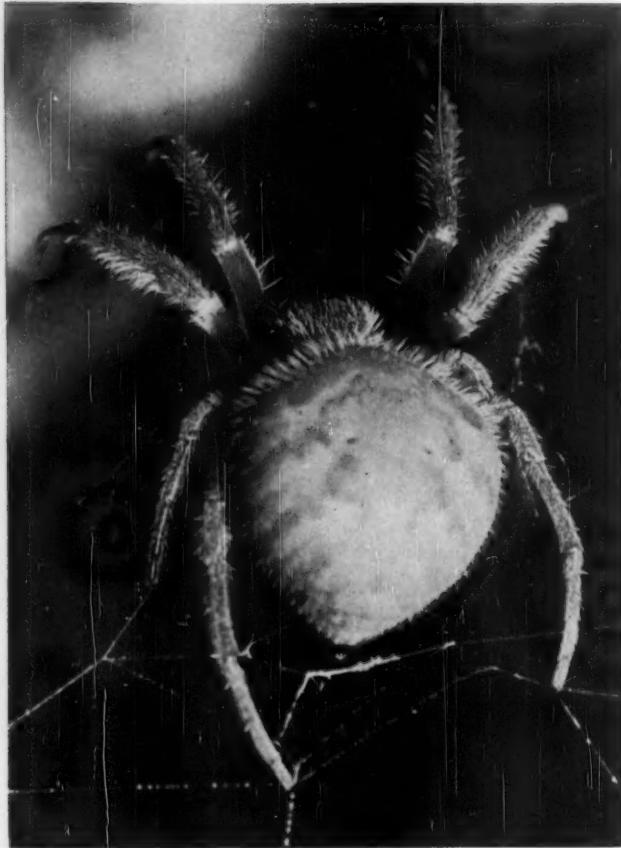


A smooth-pointed pencil is a useful tool for slipping stubborn strands of netting from a captured bird. This immature white-crowned sparrow is alert but quiet during its release.



Above, two alert robins eye their captor defiantly. Below, an adult white-crowned sparrow, already wearing a band, is well caught, but quite comfortable. The net will be cut if there appears to be any chance of injury to the bird.





The Sad Tale of a Romance

*or, how some males
never seem to learn.*

By NOEL L. ROBERTS

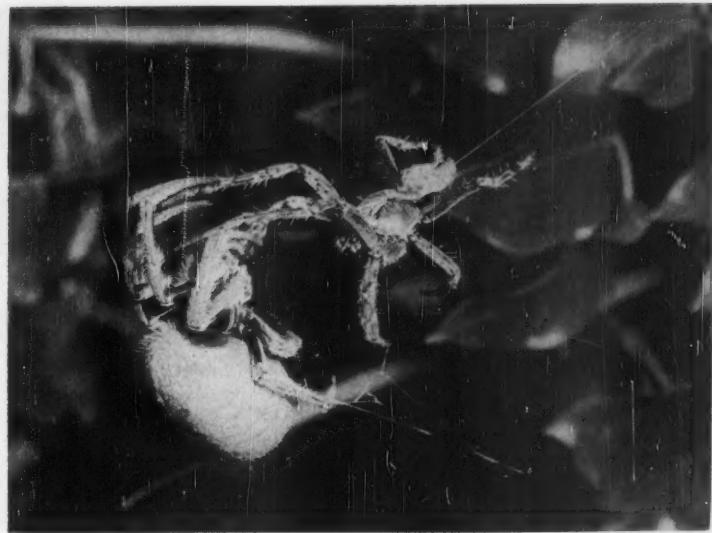
Photographs by the Author

This is *Aranea producta*. Judged by human standards she is no beauty; but the young hopeful in the picture directly below is not particularly concerned with human standards—he has more important things to think about.

Our amorous hero approaches the lady, perhaps thinking that this, indeed, will be his lucky day. The courtship of many web spiders takes place on a special thread, spun for the purpose, and the male "telegraphs" his arrival to his prospective mate.



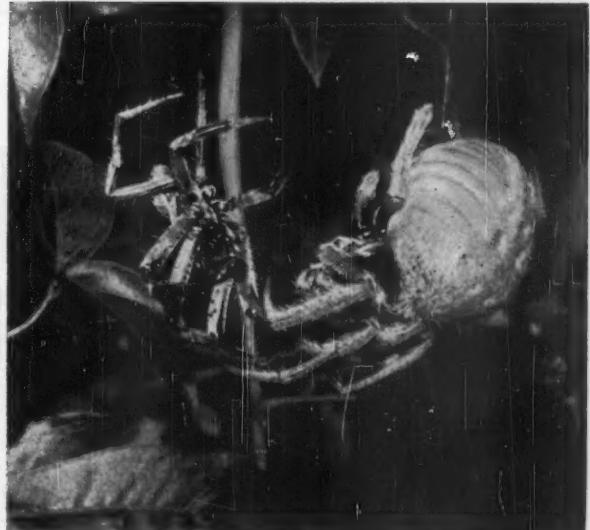
Receiving a friendly tug on the thread, the male advances to pop the question.



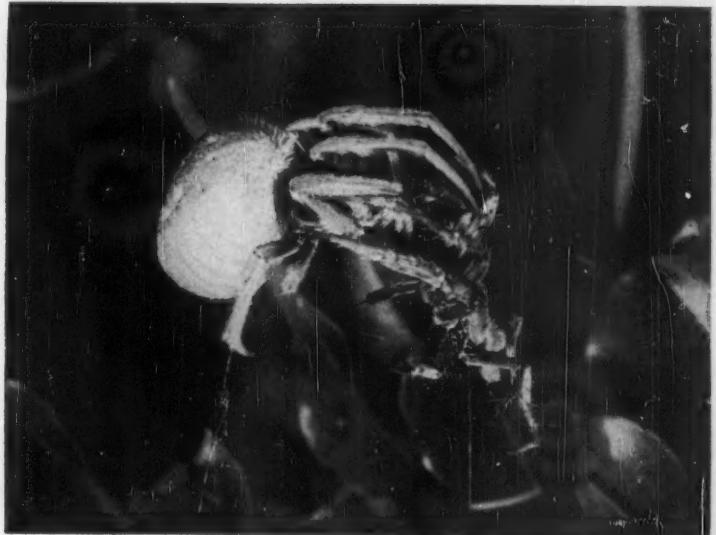
THE SPIDER *Aranea producta* is widely distributed in Australia, and is active only at night, hiding under a leaf or in some suitable shelter during the daytime. Usually, a new web is spun each night, and the old one rolled up into little bundles and dropped on the ground before *Aranea* retires at dawn. This spider has a remarkably wide range of colors and patterns, and many specimens collected in the same garden, apart from a general similarity in shape and build, might easily be regarded as different species.



Has he received a premonition of trouble ahead? None too trustfully, the amorous arachnid retreats, and engages in a bit of sidewise "ogling."



He advances again, convinced that all is well. He seems to be getting along famously, but...





Alack and alas, the hungry bride thinks he is too choice a morsel to miss, and she sinks her fangs into him. Many a male spider becomes both bridegroom and banquet.



Male spiders are smaller than the females, and some are mere dwarfs. Here, the little male of the Australian St. Andrew's Cross spider waits hopefully in a criss-cross snare of his own, near the female. His size makes him hardly worth eating.

Conservation Gets Its Wings

An Editorial

THE ARMED services of the United States have, under their direct control, more than twenty-five million acres of the nation's land area. Into a parcel of this size you could fit the States of New Jersey, New Hampshire, Maryland, and Vermont, and still have room left for the State of Delaware. And the services are constantly on the lookout for more land.

There have been in the past, and there will continue to be, serious clashes of interest between the armed services, and the people and organizations that work in behalf of the outdoors and its wildlife, and are dedicated to the wise and far-seeing use of our resources. It has often seemed that there could never be a common meeting-ground for both camps; but, as is sometimes the case, hasty decisions are not always wholly fair ones. Many of *Nature Magazine's* readers will recall, perhaps, the story of the *Miracle of McAlester*, in our issue of February, 1956, wherein was told the story of how the happy mixing of wildlife and gunpowder at the United States Naval Ammunition Depot, at McAlester, Oklahoma, resulted in a real conservation program.

You might remark, after reading the story, that one example does not make a conservation program, and that, after all, the work done at McAlester was pretty much of a one-man crusade; and so it was. But now, after several years of growing pains, one of our three major service forces—the newly independent Air Force—has embarked on a program that is designed to make conservation a working policy, within the physical limitations of its holdings, and the obvious concessions necessary for efficient military operation.

Included within the program is an item that we think might eventually prove to be of equal or greater importance than the more immediate goals, if it were thoroughly followed through. Because of the limited size of the staff available, little has so far been done under the new program in the way of conservation education in the Service; but a statement from the Provost Marshal's office is encouraging. "We hope," says the conservation branch, "that before too long every man coming into the Air Force will have been exposed to an appreciable amount of conservation education before he leaves it."

The word "conservation," as used in connection with this new program, is frankly meant to imply the improvement of Air Force property so that it will better meet the outdoor recreational needs of Air Force personnel, and, in some cases, civilians, on a self-sustaining basis; that is to say, fishing and hunting. And yet, in order to accomplish this end, all of the many facets of good conservation practise must be brought into operation, so that the net gain is certain to be a large one.

Back in the summer of 1951, General Nathan F. Twinning, at that time vice-chief of staff of the Air Force, sent a letter to the commanding officers of the far-flung Air Force installations, expressing his wish to see the start of a conservation program, and the letter resulted in establishment of many local programs. In spite of General Twining's meritorious intent, however, it was only natural that the success of any conservation operation in the field was bound to vary in direct proportion to the enthusiasm of whoever happened to be a base commander at the time. Also, the help forthcoming from Washington in the way of specific guidance to the local commanders was rather vague, and probably sounded in the field like the clicking of a half-heard telegraph key. The message was there, but what did it mean?

Almost exactly five years later—in 1956—a new conservation program was established in the Air Force, this time with more push behind it. The current program, which is actually just getting under way, and is still pretty much in the "stock taking" stage, is centrally monitored by a special section of the Provost Marshal's office in Washington, where anyone with an interest in conservation matters can find out exactly what is being done at any of the Air Force bases. Also, the responsibility for base practises has been placed in the hands of the people-on-the-scene who are best fitted for, and most interested in, conservation work.

Perhaps one of the finest examples of what can be done in wildlife and forest management is Eglin Air Force Base Reservation, the great proving grounds for new Air Force equipment of all kinds, that takes in the southern parts of Okaloosa, Walton, and Santa Rosa Counties, on the coast of western Florida. Of course, it is only fair to say that Eglin had many built-in ingredients for success, to start with. It has size—more than 466,000 acres of it, and the fact that it mostly occupies the land that was formerly Choctawhatchee National Forest places the base in an enviable position, conservation-wise.

The forestry and wildlife program at Eglin is conducted by the personnel of its Forestry Branch, in co-operation with officers of the Florida Game and Fresh Water Fish Commission, who together are responsible for year-around work with wildlife, fish, timber production, fire protection in the forested areas, and, in short, the general conservation of the base's resources.

The work that is being done at Eglin Air Force base is being done with enthusiasm, from the commanding officer right down the line; and one of the best proofs of its success, and an indirect compliment to the people who are doing the work, is the fact that a tour of duty at Eglin is considered in the Air Force as "good duty."



Near the Wisconsin River, in Sauk County, Wisconsin, stands the Aldo Leopold Cabin, once the retreat of Aldo Leopold and his family. There were few conveniences for the visitors who came to the cabin, and they needed none, for they were primarily interested in seeking the company of the wilderness.

Wilderness Heritage

By LOUISE LEIGHTON

Photographs by Ronald Rich

"CONSERVATION is a state of harmony between men and land. By land is meant all of the things on, over, or in the earth. Harmony with land is like harmony with a friend; you cannot cherish his right hand and chop off his left." "The last word in ignorance is the man who says of an animal or a plant: 'what good is it?'"

These quotations are from Aldo Leopold's book, *Round River*. Leopold, the ecologist, the naturalist, the conservationist, had a gift of expression that makes his writings unforgettable. He left some advice of prime importance to Americans, and perhaps it is not too late to heed it.

On a perfect spring day, sun shining, the earth greener and wild flowers full and rich because of ample rain, we walked across the sandy acres, through the pines, to the river. The river was, of course, the Wisconsin River, and the land was the old retreat of Aldo Leopold and his family. After reading his book, *Sand County Almanac*, we felt that we should see the things he described—and we saw them.

We left the car beside the road, and walked through the woods and meadows toward the river. We passed wild geraniums, yellow puccoon, bird-foot violets, bluebells, and the circlets of palmate leaves of the lupine not yet in bloom. All of these he mentioned in his book.

We heard thrashers warbling, orioles and cardinals fluting, grouse drumming, frogs piping, and we saw the black and gold of finches darting through the thickets. Then we came to the old cabin, and were thrilled at the sight of tall trillium blooms, mingled with columbine, bellwort, Solomon's seal, and beds of iris not yet in bloom.

The old grindstone and the pump were still there, and some of the crude benches he had made. The cabin was gray and unpainted. Lichen covered part of the roof, and the place was boarded up. It was just a shelter, without any modern conveniences. The people who came here expected none. They were seeking the company of the feathered and the furred, the leafing and the petaled, the river and the good, green earth. In short, the land. They had no need for television and the movies to entertain them, for they had the beauty of their outdoor theater, with actors like the wood-cock in his mating dance, the wild doe shielding her fawn in the thicket, and the orchestra of the song birds. We took some pictures, and stood looking at all the aging relics of the man who had so much enjoyed them. Nine years ago, he died while helping to fight a fire on a neighbor's land.

We walked on, to the river that we could see beyond the sandbars. The sand was printed by the toes of many

creatures. We saw moles scuttling like shadows through the tangled grass, and tiny frogs hopped up before us. The river with its reflections was eye-catching, as are all wooded-shore rivers on clear spring days. Leopold saw the same view in many weathers, and at different seasons and hours of the day. He called the river a *painter of pictures*.

"I know a painting so evanescent that it is seldom viewed except by some wandering deer. It is the river who wields the brush. . . To view the painting. . . visit the sand bar some bright morning just after the sun has melted the daybreak fog. The artist has now laid his colors and sprayed them with dew. The *Eleocharis* sod, greener than ever, is now spangled with blue mimulus, pink dragonhead, and the milk-white blooms of *Sagittaria*. Here and there a cardinal flower thrusts a red spear skyward. At the head of the bar, purple iron-weeds and pale pink joe-pyes stand tall against the wall of willows. And if you have come quietly and humbly, as you should to any spot that can be beautiful only once, you may surprise a fox-red deer, standing knee-high in the garden of his delight. . . Do not return for a second view of the green pasture, for there is none. . . But in your mind, you may hang up your picture. . ."

We went back to the cabin site, and climbed the gentle slope toward the west. In the distance, the grouse were still thrumming beneath the shrill chorus of the frogs and the birds. We found ourselves looking down on a miniature lake, probably an overflow from the river, ringed by willows and birches. At our feet grew more bird-foot violets, very large and rose-lavender in the late afternoon light. There were many patches of a tiny, lacy white flower. Overlooking the alluring scene below was another of the old benches Leopold placed here and there. We sat on it, and it fell apart. We wondered if he laughed, too, at our consternation. Or had his friendly ghost given it a gentle push at the critical moment?

Walking back through the Norway and the white pines he had planted, we remembered his statement about the pollen-laden pines in May. To test it, we shook the branches, and the pollen scattered like miraculous dust. The sun was getting low, and it was time to return to town.

Born in Iowa, in 1887, Aldo Leopold loved the world of Nature from boyhood, and he became one of the world's great naturalists and conservation pioneers. Like John Muir, he traveled widely, not always on foot like his predecessor, but with the same purpose in mind, and with the same acute powers of observation. He began his public career in 1909, as a forest assistant with the United States Forest Service in Arizona and New Mexico. Later, as chief of operations in that district, he helped develop our national forest policy. He went to Wisconsin, in 1924, as associate director of the Forest Products Laboratory, in Madison, and from 1928 to 1931 he conducted surveys of wildlife population for the Sporting Arms and Ammunition Institute. In 1933, a chair of game management was created for him

by the University of Wisconsin—the first of its kind.

Leopold's field notes, observations he recorded during his leisure hours spent in the fields and forests of the United States and Canada, provided the material for his books. His ideas about conservation are still far in advance of much of the work that is being done today. But conservation is being constantly advanced through research and teaching, and federal aid is dispensed in many fields. Science, which at first sought better ways to live off the land, now seeks better ways to live with it, and to preserve it. But Leopold said: "We shall never achieve harmony with land, any more than we shall achieve justice or liberty for people. In these higher aspirations, the important thing is not to achieve but to strive."

Whenever a wilderness area is destroyed, whether by wind or fire, flood, drought, or pestilence, whether through tree cutting by lumber companies, or by industrial groups or governmental agencies that build power dams and flood out vast tracts of forest, by hunt-



Ronald Rich investigates the old grindstone that remains as a relic near the Aldo Leopold cabin on "Sand Acres."

ers who decimate the game, by resort owners who fill the open places with cabins and motels and roads—by any means whatsoever, although it be in the name of civilization and progress, *it can never be restored*. Yes, trees can be planted, wildlife and fish placed in wood or stream, but the virgin wilderness and beauty can never return. The destruction of beauty alone is no small loss to man. But something has gone from the soil itself.

In the cycle of seasons and through the years, all native plant life *takes* from the soil, but endlessly returns to the soil that which it has taken. When the cycle includes man, seed to plant, plant to fruiting and harvest, harvest to man, then man must return to the soil that which he has taken, the original nourishment of that soil. This is the meaning of true conservation. The failure of man to recognize and fulfill *his* part results in

vast tracts of quack grass, thistles and mullein, or worse.

Among wilderness things that are gone forever are the passenger pigeon, the virgin pine forests of Wisconsin and other States, the miles of tall prairie grass spangled with flowers, our ocean and lake shores, once picturesque, now traversed by roads and lined with homes and public resorts.

No man can live without wilderness. It is an innate urge and longing, a heritage we cannot deny or escape. It is an expression of peace and contentment. Thoreau



A tin can and a gallon glass jug served Aldo Leopold as a rather primitive rain-measuring instrument.

wrote: "In wilderness is the salvation of mankind." I was teaching in a slum district of a large city, years ago, and in June, when school was nearing the close of the year, I took my fourth-graders for a picnic. The street car carried us out past the suburbs, into the country. At the end of the line, we alighted. The picnic grove was in sight, about a quarter of a mile down the road. The children had no sooner alighted when a spirit of wild ecstasy seemed to take possession of them. Away they went, across the road, over or under the fence, helter-skelter, into the meadow grass on the other side. Not to walk or run. No, they crawled. On their hands and knees they went the rest of the way, through

that green, waving expanse. I shall always remember that June day, and the joy in the faces of those children when they arrived at the grove. During that short period of contact with the "living green," my little "demons" had been transformed into saints and angels.

Why do thousands of tourists drive across our land, leaving destruction and disorder in their wake? Why do we have vandals and "litterbugs" in our parks? Perhaps it is a cultural lack, or a disregard for the pleasure of others; or just plain ignorance. Aldo Leopold proposed a "land ethic;" a code of obligations to the land as binding as the Ten Commandments are to the morals of humanity. Said Leopold, "Recreational development is a job not of building roads into lovely country but of building receptivity into the still unlovely human mind. . . We can be ethical only in relation to something we can see, feel, understand, love, or otherwise have faith in."

If education is the answer, then ecology, conservation, and research, are all important. Much is being done, but there must be more. More people must be introduced to the wonders of our planet. Children's camps, Scout work, and canoe trips in the wilderness, are all part of this education. There should be more camps like the one at Upham Woods, established by the University of Wisconsin, near Wisconsin Dells, where Wakelin McNeel, "Ranger Mac," teaches and inspires hundreds of children and adults to understand and love the wilderness. Arboretums and wild flower sanctuaries are instructive. The Eloise Butler Memorial Wild Flower Garden in Theodore Wirth Park, Minneapolis, is a model of its kind.

"The Clearing" in Door County, Wisconsin, on Green Bay near the tip of the peninsula, is the fulfilled dream and legacy of Jens Jensen, the landscape artist and architect, whose work and ideals were described by Virginia S. Eifert in the January *Nature Magazine*.

Both Leopold and Jensen bequeathed their ideals to us in their books. Also, they left memorials of "the land," as Leopold called it. Jensen left us "The Clearing." Aldo Leopold's sandy acres on the Wisconsin River are still cherished by his family and friends; but another land memorial has also been established in his memory. The "Aldo Leopold Memorial Forest" has been set aside in Sauk County, Wisconsin, by a group of his University friends and associates.

True education, which includes a knowledge of the vast importance of preserving our natural resources, a culture that develops understanding, and a reverence for the beauty of our land, plus a wisdom that sees the value of our wilderness areas, is the only safeguard against irreparable loss.



DESERT LAMP

By Velma Fehling

*In the desert's house no ceiling at all
Over mesa table and rim-rock wall.
Strange they light so large a room
With a fragile, fluttery cactus bloom!*

Behind the massive walls of the Castillo de San Marcos are living quarters for a garrison, storerooms, a council chamber, dungeons, guardrooms and a chapel, and at each corner of the walls there is a sentry-box or watchtower.

PHOTOGRAPH BY J. CARVER HARRIS



Sea Shells of Destiny

By PAUL MASON TILDEN

EVERY YEAR more than half a million Americans pour through the sally-port of the old Spanish fort—the Castillo de San Marcos—at Saint Augustine, Florida. Defiant of time, this magnificent old structure, except for a few necessary repairs of upkeep, stands as it did when Spain was wrestling with England for the possession of the rich New World.

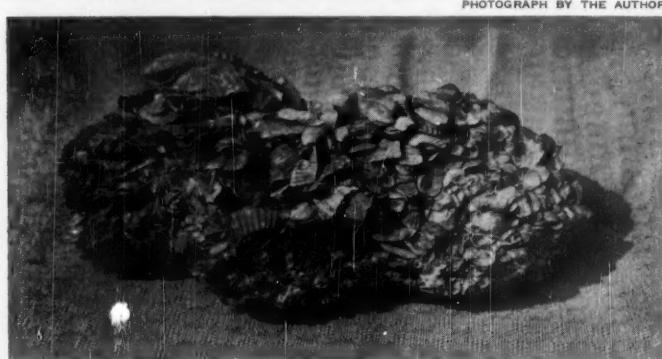
Among the facts that the visitors learn from the National Park historian-guides at the Castillo, in the brief space that can be allowed to touring, is that this fort was never captured by an enemy. But not many visitors allow themselves enough time to discover the reason why, in its day, Castillo de San Marcos was invulnerable. The truth is almost unbelievable at first glance. It was impregnable because it was built of sea-shells, relics of teeming marine life in a sea of the past.

Does this sound absurd? Not when you know the rest of the story.

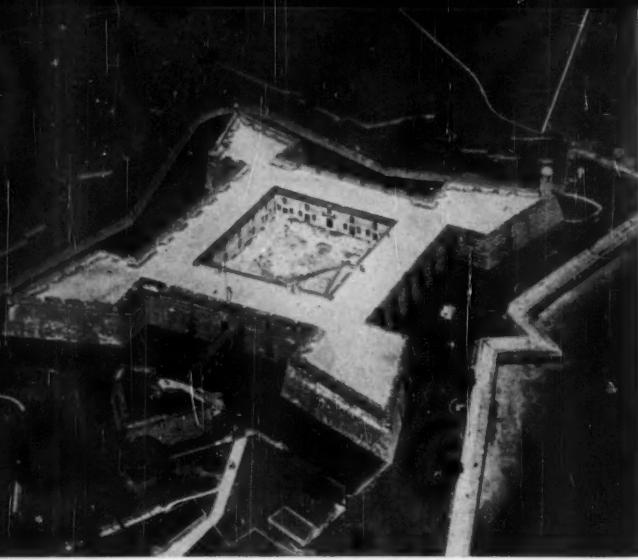
Nature laid the foundation for the rock that would later laugh at cannon shot. Of course, Nature did not care a whoop whether Florida was going to belong to Spain or England. That was sheer accident. But it was going to be important, ages later, to human beings, that in a relatively recent period of geological time, the present east coast of Florida was under the warm waters of a shallow sea, where mollusks thrrove on a tremendous scale.

Geologists suspect that this invasion of high water that flooded the low-lying coastline of Florida was not connected with any particular downward earth movement under the peninsula. They think, rather, that the extra twenty-five feet of water in the earth's oceans at

that time represented the contribution of the melting sheets of Pleistocene glacial ice. At many places in the world, geologists have detected old sea beaches at various levels, agreeing so well with calculated periodic glacial ice retreats that they can hardly be ignored as coincidences. The rock of the Anastasia limestone formation apparently was laid down as a



Coquina is a special kind of limestone, and is composed chiefly of broken bits of sea shells, cemented together with lime. Close inspection also may reveal a small amount of admixed sand, as well as broken pieces of coral.



NATIONAL PARK SERVICE PHOTOGRAPH

series of beach-bars along the east coast of Florida, during an interval of the Pleistocene age known as Pamlico time—perhaps half a million years ago—and the sea that produced the beach-bars is referred to as the Pamlico Sea.

In the Pamlico Sea, there was one particular mollusk that seemed to propagate like magic in the warm, shallow water; and one whose modern shells are still being cast up by waves on Florida shores—the mollusk *Donax*, known to shell-collectors as the "butterfly" or "pompano." Eventually, the vast shell-layers that *Donax* left at the bottom of the Pamlico Sea became solidified into a mass that, mixed with sand and cemented with calcite from the shells, became rock.

The defenders of the important Spanish outpost of Saint Augustine had had no great luck with their early forts. They were built of wood, were inflammable, and rotted quickly in the humid atmosphere. They needed

Coquina is still used today as a building stone, and this coquina quarry on Anastasia Island, across the Matanzas River from Saint Augustine, is not far from the quarries that produced the coquina for the Castillo.

PHOTOGRAPH BY J. CARVER HARRIS



The ground plan of the Castillo is shown in this aerial photograph; visitors reach the one entrance over a 40-foot water-filled moat, via a bridge that was formerly operated as a drawbridge.

something more substantial. They wanted rock. The Spaniards had noted that on Anastasia Island, just across the Matanzas River from Saint Augustine, there was strange rock that seemed to be made of sea shells, pressed together somewhat as a bale of hay is compacted. And they noted something else. Although they could easily cut out big chunks of this rock, and shape it with a carpenter's saw or an axe, the surface soon began to harden; and, exposed long enough to the air, it actually became flinty.

Here was the answer to a fort-builder's prayer. This was the Rock of Destiny that was to maintain Spain in Florida against the might of British armament. This was the rock—look at it carefully if you have a chance to visit the old Castillo—that gave the sneer to the British General Oglethorpe when that worthy came down from Fort Frederica, in Georgia, and laid siege to Saint Augustine, fully convinced that, because he had temporary control of the sea, the Castillo would fall like a ripe plum.

Oglethorpe landed on Anastasia Island, just opposite the fort, and set up a battery of guns that would, in spite of their feebleness compared with the cannon of modern times, have shattered a granite bulwark, and pulverized and breached a brick exterior. For thirty days the British pounded away with iron shells, while the population of the city huddled inside the Castillo, and spent their time in starving and in prayer. On the thirtieth day, one of Oglethorpe's lieutenants, viewing the result of the bombardment, exclaimed in despair, "What's the use? Our shot have no effect on San Marcos! Why, it's just the same as sticking a knife into a round of cheese!"

That was precisely true. Whether the British shells landed atop the Castillo, or whether they hit the shell-rock blocks of its sloping sides, it was simply waste effort. The coquina—which is what the Spaniards called this Florida sea shell rock—simply took the cannon shot just as a sponge would take a jab of your thumb. You could dent it, bruise it, knock the surface off it. Indeed, when the bombardment ceased, there were some round shot sticking in the coquina like raisins showing through the sides of grandma's cake. But the Castillo was unshaken. With 2500 civilians sheltered within its walls, the killed and wounded were almost none.

Now, as to the construction of this remarkable fort. With an eye to the British, the Queen of Spain gave the go-ahead signal to the Governor of Florida, and his military engineers, for the construction of this Spanish strong-point in the New World. But construction took money—and money was hard to get. Indifference and red tape along the chain of command between Spain and the Florida colony often throttled the work. From the time the first block of coquina was laid for the founda-

A luxuriant growth of maidenhair ferns festoons the walls and ceiling of one of the Castillo's vault-like rooms, and is preserved in its natural condition as an additional point of interest.

tions, in 1672, until the fort was in condition to be defended, a full fifteen years had passed.

First, there had to be a gathering of raw material, and the assembling of the talent to use it. To get at the coquina deposits on Anastasia Island, labor gangs of peons and convicts had to clear away the dense palmetto and live-oak thickets—an unenviable job, intruding on the favorite haunt of the Florida rattlesnake.

Then the quarrymen got busy. They chopped deep grooves in the soft yellow stone, to be followed by men with bars and wedges who cracked out the heavy slabs. Ox-teams hauled these to the Matanzas, and rafts ferried them across to the mainland. Oyster beds were combed for shell, to be burned by the ton for the necessary mortar.

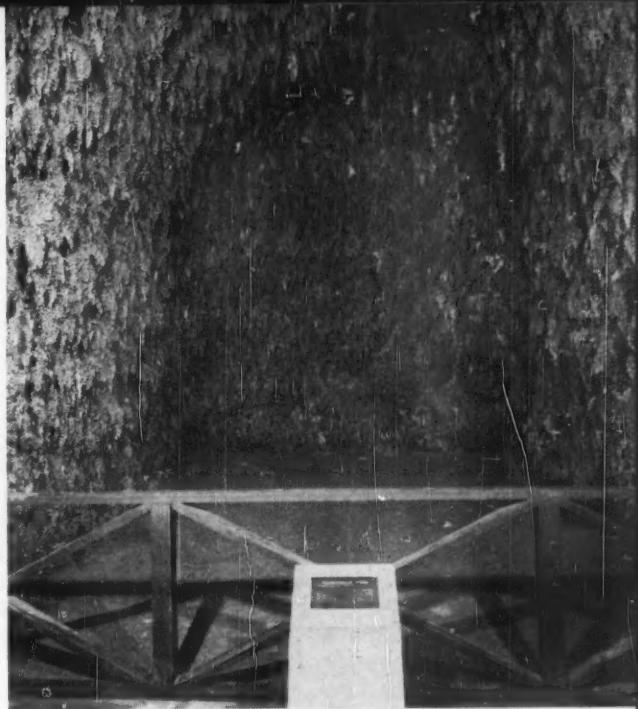
The bosses on this job were professionals—military engineers who brought their knowledge of European fortifications to the New World. Among the raw labor, however, there were some who found involuntary employment. Men caught smuggling English merchandise into the Florida colony were likely to work out a five-year sentence in the quarries, helping cut stone for the fort. If they shirked their task, they were in line for a double term at some Spanish labor camp in North Africa. Most preferred Florida.

Anastasia Island is a segment of the Florida mainland, bitten out by the tidewater Matanzas; in fact, this river is part of our intracoastal waterway. The military men in charge of the work on the Castillo were not blind to the danger of an attack from the rear—that is, up the Matanzas from its southern inlet, some fourteen miles below the fort. The only defense at that point was an innocuous wooden watchtower, that had already been overrun once by a handful of pirates. But a substantial stone fort at the south entrance would relieve the threat from that direction.

The squat, rather gloomy-looking bastion called Fort Matanzas was the Spanish answer to that problem. Conveniently, there was a marshy little island in the middle of the Matanzas, a gunshot up from the inlet; and although the quaking mud offered a problem in stone fort-building, it was too good a site to overlook.

Fort Matanzas was built there, where its cannon could command the inlet, with its shifty sand bars and narrow channel. The same useful shell-stone from the royal quarries went into this fort, also; and while it was a-building, Oglethorpe of Georgia sailed up to the inlet, and measured his chances for an attack. He decided to postpone the operation.

Some early incidents occurred near Fort Matanzas that furnished a name for the river. During the first days of settlement, the Spanish



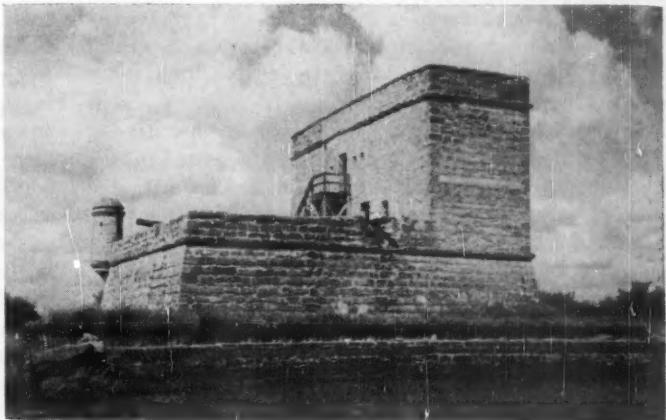
PHOTOGRAPH BY J. CARVER HARRIS

and French were jealously disputing ownership of Florida. The French built Fort Caroline, on the Saint Johns, while the Spaniards located at Saint Augustine. During the maneuvering, a band of Frenchmen were shipwrecked below Saint Augustine. They attempted to march north in two groups, back to Fort Caroline—but the Spanish caught them at Matanzas inlet. What happened to the French forces may perhaps best be judged by the English translation of the Spanish name for the locality. *Matanzas*, in Spanish, means "sluggers."

The English finally came into the long-coveted Florida peninsula, but not by force of arms. What Oglethorpe had not been able to win with his artillery, the British secured by diplomacy. After the American Revolution, the Spanish got (continued on page 108)

Squatty Fort Matanzas, some 14 miles down the Matanzas River from the Castillo de San Marcos, was constructed of the same coquina, and was built to stop possible attacks on the Castillo from the rear.

NATIONAL PARK SERVICE PHOTOGRAPH



A naturalist looks at

Man as a Hunting Animal

By ALEXANDER F. SKUTCH

Illustrated by Garnet Jex

THE MAMMALS, among which the zoologists classify man, are a varied assemblage of animals with the most diverse dietary habits. Some, like the grazing horse, the ant-eater, the three-toed sloth that browses almost exclusively upon the foliage of a single kind of tree, and the huge whales that subsist upon tiny marine animals, are highly specialized for eating and digesting a single type of food. Their teeth, alimentary tracts, and often their limbs as well, exhibit adaptations for the efficient gathering and utilization of the preferred nutrient. One need recall only the cow's peculiar dentition and complex, four-chambered stomach, which together form a remarkably effective apparatus for cropping, fermenting, and digesting green herbage. Others of the mammals, like the opossum and the rat, thrive upon a more varied diet; and their teeth, although perhaps less admirably adapted for cutting and triturating a particular food, are capable of dealing in a satisfactory manner with a wide range of vegetable and animal products.

Among these mammals with less specialized dentition and more varied diet are the primates, the group to which man belongs. Although some, like the howling monkeys of tropical America, subsist largely upon foliage, which they devour in the high tree-tops, many enjoy a less monotonous fare. Small arboreal monkeys eat a variety of fruits, succulent shoots, fat insect grubs, and, now and then, the eggs or nestlings of birds. The terrestrial baboons are nourished by fruits, starchy roots, and such small creatures as they find by turning over stones and fallen logs. But none of the primates, not even the great apes, are primarily carnivorous; none is equipped by Nature for running down, pouncing upon, or otherwise capturing living prey, in the manner of the wolf, the lion, the weasel, and the hawk.

In all this great family of the primates, only one small division, that which includes our own species and such close relatives as the extinct Neanderthal man, has, it appears, ever become a hunter of warm-blooded animals for their flesh. How these bipeds, so little fitted by structure and habits for the pursuit of flying birds and fleet-footed quadrupeds, came to depend upon such animals for food is a matter about which there has been much conjecture; yet the fossil evidence hardly permits us to follow the transformation in detail. A few of its salient turns are sufficiently obvious, even if it is hardly

possible to assign to them definite dates and localities. In the first place, man's ape-like, arboreal progenitors gradually came to dwell upon the ground, either as a result of the drying and thinning of their ancestral forests, or because overcrowding in these woodlands drove some of them forth to neighboring savannas and open country. It is certain, however, that some hun-



As a predatory animal, primitive man owed whatever success he achieved to his dawning intelligence, and to his chance alliance with the ancestral dog.

dreds of thousands of years ago our forebears were leading a terrestrial life, many of them far from the tropical forests, in lands where the climate was becoming more severe as the continental glaciers pushed slowly down from the arctic regions. In these circumstances there was a gradual impoverishment of the vegetation, which yielded ever less of the juicy fruits and succulent shoots that nourish the larger apes. Where the seashore did not offer an abundance of easily gathered shellfish, ancestral men had either to supplement their miscellaneous vegetable diet with the flesh of some of the larger quadrupeds and birds, or else perish. Some, at least, of them took the former course, and survived.

That Stone Age men at last became fairly proficient as hunters of large animals is proved not only by the

testimony of modern travelers who have visited surviving primitive cultures, but by the great accumulations of the bones of the bison, reindeer, wild horse, and hairy mammoth at Paleolithic camp sites in Europe. Yet this success in the chase owed little to such innate endowments as make the wolf and the tiger efficient killers. Two legs do not give the same fleetness as four; and even if quadruped prey could be caught by the biped, he lacked long, projecting fangs for severing its veins or tearing out its vital organs. Whatever success primitive man achieved as a predatory animal he owed to his dawn-

ing intelligence, which led him to fabricate weapons of slowly increasing efficiency, and to his chance alliance with the ancestral dog. The canine's keener nose and swifter feet helped man to track down and round up the quarry, which he dispatched with a club, a stone axe, or a flint-tipped spear. Later, when he had invented the bow and arrow, and found poison for its tip, the savage hunter could slaughter his victim from a greater distance.

The expedient of hunting large animals enabled man to survive the severe conditions of the Ice Age in the north, and in many parts of the world to pass over a difficult stage in his long march from a gatherer of wild fruits and roots to a cultivator of food plants. So long as he subsisted primarily upon the flesh of hunted animals, and such miscellaneous vegetable products as he could find in the woods and meadows, man remained a savage whose life was, as Hobbes said long ago, "solitary, poor, nasty, brutish, and short." Except where the sea affords more abundant sources of food, the primitive hunter and food-gatherer requires so great an area for his support that even within the more bountiful tropics it takes a square mile or more of land to support a single individual. Men so scattered, depending upon a fluctuating and uncertain food supply, never succeed in developing their latent capacities, in raising their art or religion above their crude rudiments, or in cultivating letters, science, or philosophy. They live in small groups, constantly at enmity with each other, in fear of their neighbors and a thousand perils real or fancied, and commit the most shocking deeds under the influence of the violent, ungovernable passions of the savage.

Only after they somehow learned to cultivate grains and other vegetables did our ancestors enjoy that relief from constant servitude to their daily needs which is the indispensable prerequisite to all higher culture. A large share of this gradually acquired leisure was no doubt taken up with occupations we can hardly approve: with waging wars for the capture of women, slaves and



A knowledge of agriculture was a prerequisite to the attainment of a higher culture.

trophies, with savage feasts and barbarous displays of superfluous luxuries, with scheming by the powerful and astute to reduce to serfdom their milder and more industrious neighbors. But, here and there, a man of finer fiber employed his time in attempting to copy the beautiful forms of Nature, in composing poetry and, later, prose; in striving to bring greater harmony into life, in pondering the enigmas of existence, or in seeking to approach the source of his being. Thus were born art, literature, ethics, philosophy, religion—pursuits that can scarcely be cultivated, and certainly can never be carried to a high level, without the leisure, the relative security, and the settled life that agriculture brought to men.

Today, a negligible proportion of mankind, comprising the most backward races in the least accessible regions, depend wholly or even largely for food upon the herbs and fruits they find in the wilderness, and the free animals they shoot or ensnare. Although the sea continues to yield, as a free bounty, an important contribution to man's diet, the terrestrial foods that keep us alive are produced almost wholly by human effort, chiefly on the farms. When computed as pounds of flesh, the hunters' annual kill of free birds and quadrupeds in a country like the United States makes an impressive total; yet this is a trifling contribution to the national economy. Few, indeed, are the people who would starve, or even lose weight, without the meat of these slaughtered animals. As a means of procuring food, the hunting of animals has become obsolete. As we view in retrospect the long history of the human stock, we see clearly that it was a temporary expedient to meet a particular crisis—a make-shift that was tried and abandoned because it failed to permit mankind to cultivate its special capacities, and rise above the level of the savage.

Although the chase of free animals failed in its primary and obvious purpose of providing food for a growing population, hunting has not for that reason been



"Hunting as a pastime... reveals a deplorable poverty of imagination."

abandoned as a pursuit that we have outgrown, like head-hunting, human and animal sacrifices, bloody fertility rites, slavery, the exposure of unwanted infants, the ritual or ornamental mutilation of the body, and similar practices, widespread at an earlier stage of human development, that fill us with horror or disgust. On the contrary, there has been of late a steady increase in the number of hunters in some of the industrially

most advanced countries; vast sums are spent on arms, ammunition, and accessory equipment, a voluminous output of books and periodicals stimulates the hunters' zeal, and governments maintain at great expense elabor-

ate technical services for the purpose of providing a continuing abundance of living targets for the hunters' guns. No one seriously contends that the object of all this huge expenditure and effort is the procuring of necessary food. Among all but the most primitive of existing peoples, hunting is carried on largely or wholly as an amusement, or form of recreation. The problem



A photographic record of an excursion makes a fitting trophy.

We may begin this appraisal by admitting at once that it is beneficial to those who dwell in crowded cities, or engage in sedentary occupations anywhere, to sally forth from time to time to the open country, to the fields and woods and waters. Such periodic excursions provide wholesome exercise, and afford relief from the nervous strain of continuous contact with others of our kind in a society tense with haste and fear. The question is whether, when dedicated to violent and bloody pursuits, these visits to the natural world do not lose much of their potential value, perhaps injuring the spirit even if they benefit the body.

The least of the counts against hunting as a pastime is that it reveals a deplorable poverty of imagination. Men so steeped in acquisitiveness and unremitting purpose as we moderns can scarcely cast off our purposeful attitude in our hours of leisure; even when we go forth from our workshops and offices avowedly for recreation, we must go in pursuit of something, and often of something tangible that we can carry home. This is certainly our misfortune, yet I suppose we must accept and make the best of it. But can we find no more fitting trophy of our wanderings over hill and vale, our tramps through the peaceful countryside, than the limp and bloody carcass of some animal we have slaughtered? A photographic record of our excursion, such as anyone might make with modern equipment, would be more adequate and permanent. Sketches by our own hand would be still more precious to us, for we pour more of ourselves into them, interfusing our personality with the scene or object that we interpret as we copy. The treasures of knowledge that a little patience in the observation of living things can uncover, the deeper understanding that may be ours if we go to Nature in a mood of quiet contemplation, are rewards of inestimable value. But if we must bring back some material token of our outing, a pine-cone, or a dry fruit that reveals curious adaptations for dispersal, a shapely or glittering pebble from the bed of a stream, a cocoon to hang at the window until the slumbering insect emerges and flies away,

we must examine today is whether this pursuit, which failed in its primary purpose of supporting human communities, satisfactorily fills its secondary, or derived purpose, of providing wholesome recreation.

are fitter and more enduring mementoes than a putrefying carcass. But it requires some imagination to think of these things.

Moreover, the huntsman is blind to his own most pressing necessity, which is to calm a mind vexed by the thousand petty cares of life, to permit the free expansion of a spirit pinched by our habitual concentration upon ourselves, our problems, and our needs. But the sweet repose of Nature, the calm thoughts it is capable of engendering, are lost to the mind intent upon destruction. To shatter the quiet peace of woodland and marsh with the loud explosions of shells, that bring panic to all their more alert inhabitants, reveals a pathetic lack of appreciation of the fitness of things. Not only do we make it impossible for the natural world to yield us the healing balm we so urgently require, we ruin its charm for every sensitive mind within sight and hearing. One who goes forth to enjoy the mellow autumn days of northern lands, when after the bustle of summer activity plants and animals are preparing for winter's long repose, too often finds the lovely countryside a pandemonium of gunfire, and may hurry back to his stuffy apartment or office amidst the city's less ominous din.

Worst of all, the slaughter of animals for pleasure prevents the growth of imaginative sympathy, and blunts all the finer sensibilities of the human mind. Hunting is often defended by the "sportsman" on the ground that Nature is "cruel," that animals of all sorts kill other weaker animals for food, and that, in making such use of other creatures as we will and can, we are merely following the example of Nature. But those who advance this argument overlook, willfully or carelessly, the fact that slaughter at long range by mechanical weapons, often in unskilled hands, causes more suffering than killing by direct contact with organic weapons, as



Too often one finds the lovely countryside a pandemonium of gunfire.

in practically all predatory animals. A large proportion of the birds and mammals struck by the hunter's bullets are not killed but, more or less severely wounded, manage to escape their persecutor to die slowly of festering lesions or starvation, or perhaps to live for months as pitiful cripples, bearing pellets of lead in their flesh.

Although not assessable by us, the amount of pain they endure is in all probability very great. One with a modicum of imaginative sympathy would place on one side of the reckoning the long-continued agony of these less fortunate victims of his gun, on the other his brief pleasure in the chase, and find that the first so far out-

weighs the second that without further argument it vetoes his indulgence in this coarse amusement. To persist in an occupation whose adverse consequences to other living things are so immeasurably greater than their benefits to self reveals a lamentable deficiency of that feeling for fairness and proportion which is the very foundation of the moral life. It is to act in utter disregard of the Golden Rule.

Even leaving aside the consideration of pain, which can be known in its full intensity only in our individual selves, the thought that a form of such beauty and grace, an organism of such abundant vitality, as a wild bird or a woodland quadruped, should, through our agency, and for no purpose save our transient pleasure, be suddenly transmuted into a carcass—or even worse, a starving cripple bereft of strength and lustre—would distress a mind sensitive to all the implications of life. The ethically awakened man is careful not only to avoid the infliction of needless suffering upon any creature, but is concerned for the preservation of form as such, and especially for those intricate and splendid forms that are the product of eons of evolution. He recalls that, whatever else he may himself be, he is demonstrably a complex form, and upon the preservation of such form his being depends. And, further, such a spiritually awakened man would become ashamed of the fierce, destructive passions to which he gave free play in the pursuit of living victims, disturbed that he ever found

gratification in this baser component of his nature.

When we take the long view of the role that the hunting of free animals has played in the whole evolution of mankind, we can be sure that if our species continues its onward march and does not, as some fear, degenerate in an orgy of destructive fury, this bloody pursuit will become as obsolete as a form of recreation as it long ago became as a method of procuring food. As men grow in spiritual stature, they will not fail to see that this activity, which failed in its primary purpose of supporting growing human communities, fails even more tragically in its secondary purpose of furnishing recreation for men who without it have ample means of subsistence. As a mode of procuring food, it did at least meet a pressing need, and helped tide the human stock over a difficult period of transition. But as a form of amusement for modern, agricultural man, hunting fills no need. He has countless superior forms of recreation, more beneficial to body and spirit; and the continuance of this outgrown pursuit serves only to retard the flowering of the finer elements of our nature at the same time that it keeps alive those base and savage passions which the good and the wise have ever striven to subdue. That a pursuit which hard necessity forced upon an ape that had somehow deserted the trees for the ground, should ever become a pastime worthy of a rational and moral being, is so intrinsically improbable that we could expect no other conclusion.



FOX ON THE DOORSTEP

*Time was not right
When the fox came down from the hills
To curl like a dog on the doorstep.
But in his extremity
A curious guile slowed his pulse
In that unlikely place;
Brought him to lay his feral beauty
Like a sacrifice on the altar of a doormat.*

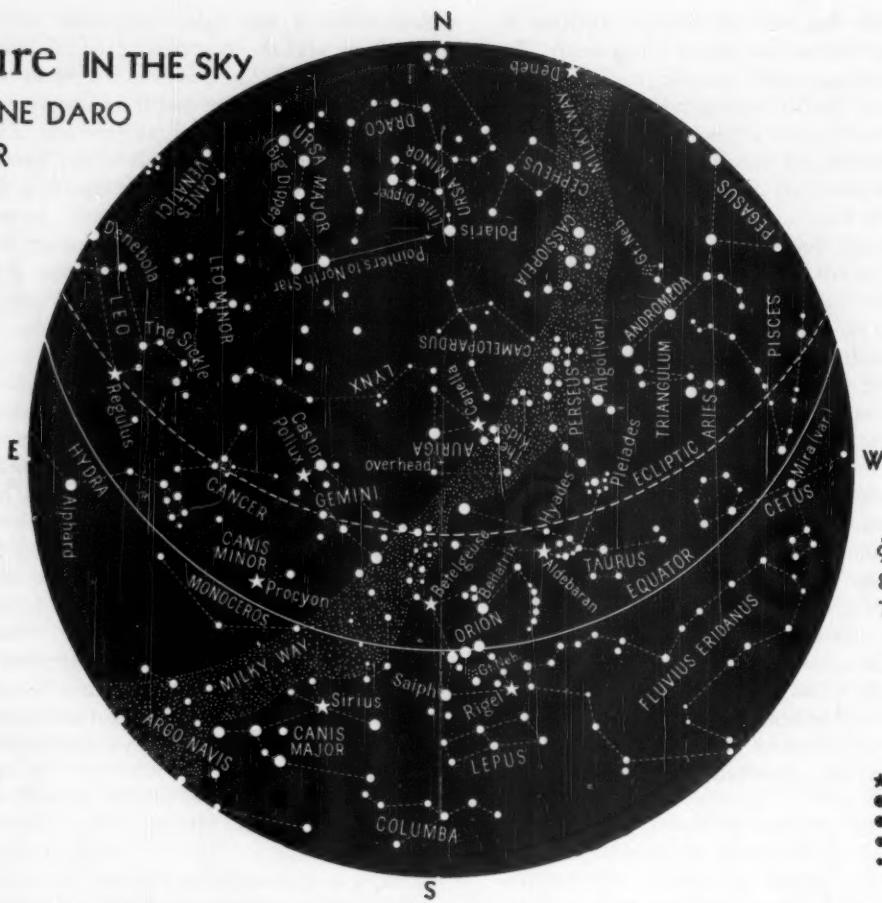
*Time was his necessity—
And rumor pricked his ears:
If ever wolf couched with the lamb,
The lion with the ox;
If ever the pact was made,
The sleep taken in security,
This stormy Saturday must see the start of it.*

*But the time was not right—
The heavens had not spoken
Nor the earth called out
It was a day without covenant
And the heart was still to be broken.*

Cleo Sibley Gross

Nature IN THE SKY

By SIMONE DARO
GOSSNER



9 P.M., Feb. 11
8 P.M., Feb. 15
7 P.M., Feb. 28

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

Fun with Your Camera

Did it ever occur to you that the astronomical photographs taken professionally in the nineteenth century were obtained with equipment far inferior to the ordinary cameras of today? Even now, some professional work is done with cameras that are no better than your own. Whether you own a simple Brownie or an elaborate Leica, you can spend many enjoyable hours photographing the sky, and, after a little experience, you can probably think up projects of your own.

In most cases a tripod is required, but if you do not own one, you can still obtain satisfactory results by using a stack of books, or any other device that will keep the camera steady during a time exposure.

Because of the daily rotation of the earth on its axis, the whole sky appears to turn around the North Pole

in twenty-four hours. Thus, if a time exposure is taken with a fixed camera, each star will produce a trail, instead of a round image. The length of the trail depends, of course, on the duration of the exposure. It depends, also, on the position of the star with respect to the North Pole, the stars closest to the pole describing the smallest arcs.

These star trails may be put to many uses. We shall consider here two possibilities: recording constellations, and photographing the daily motion of the stars around the pole.

Any camera is suitable for this. Set the focus for infinity—plain box cameras require no setting at all—and use the full aperture. A fast, panchromatic film (Kodak Verichrome or faster) developed in a slow, con-

trasty developer gives best results. If you have your films developed commercially, you should tell your dealer that these are sky pictures. He will know how to process them.

Set your camera on its tripod, or prop it up rigidly in some other way. Aim it at a constellation, and make a five- to ten-minute exposure. The negative will show a short trail for each star, the thickness of the trail depending on the brightness of the star. Place the negative with its gelatin side face-down on your desk, and cover it with a piece of tracing paper. Draw a dot at one end of each trail, using dots of different sizes to correspond to the thickness of the various trails. This will give you an accurate drawing of the constellation as it is seen at your latitude. Keep a record of the date and time of the photograph, and the direction in which the constellation was seen in the sky. If you repeat the observation of the same constellation at another time of the year, and compare your records, you will have a good demonstration of the annual motion of the earth around the sun.

In order to record the daily motion of the earth on its axis, set your camera in the same way as above, but aim it directly at the Pole Star. Choose a particularly dark night. Use a lens shade, if you have one. Make a thirty-minute exposure, close the shutter for one minute, and, without moving the camera, make a second exposure of one minute *on the same negative*.

The picture will have a series of short concentric arcs, representing the trails of the stars, with a little dot at one end of each trail. The dot is the result of the second (one-minute) exposure, and serves to indicate the direction of the motion. It will be noted that the motion is counter-clockwise around the pole. Note, also, that the image of the North Star is also somewhat trailed, and that it does not coincide with the center of motion. In other words, the North Star does not indicate the true position of the North Pole.

You might want to experiment a little with the exposure time. If a thirty-minute exposure builds up too much fog on the negative, it may have to be shortened to fifteen or twenty minutes. On the other hand, if the night is very dark and you happen to have a lens shade, try exposing for as much as an hour, since this would double the length of the trails.

If you are very patient, and if you own a good camera permitting aperture at f/6.3 or better, and a tripod, you can try your hand at hunting meteors. Patience is essential, because you do not have time to photograph a meteor when you see it. All you can do is make a long exposure on a region of the sky, and hope that at some time during the exposure a meteor will cross the field and leave a trail on your film. The meteor trail is recognizable because it is much longer, and does not follow

the direction of the star trails. Be suspicious of any such trail discovered on the film after an airplane has passed in that general region of the sky. Preferably, reserve your attempts for those nights on which meteor showers are expected. The Perseids (maximum on August 11), and the Geminids (maximum on December 12), are the most favorable. Meteors are always brighter and more numerous after midnight.

You may use exposures of ten to thirty minutes, or even up to one hour, if the night is dark and moonless.

Settings, film, and developer are the same as for the pictures of star trails described above.

If your camera lens has a diameter of at least one inch, it can take satisfactory pictures of the sun in total eclipse, and of the moon.

To photograph the full, or crescent, moon, set the camera at infinity, with full aperture at f/12. An exposure of 1/100 of a second is generally sufficient.

The sun in total eclipse looks its best when photographed with 35mm

Kodachrome or Ansco color film. Set as for the moon, but use f/8 to f/4.5. Take as many pictures as the duration of the eclipse will allow, varying the length of exposure from 1/100 of a second to one second. Pictures of the sun and moon taken with commercial cameras are very small, and often disappointing when seen for the first time, but they are nevertheless interesting to take.

The aurora borealis, or northern lights, is a beautiful phenomenon that lends itself readily to amateur photography. It is worth a try with any kind of camera, but the best results are obtained with the very fast ones like the Leica, Argus, Contax, Super Ikonta, or Kodamatic. For black and white pictures, use a fast panchromatic film (Kodak Royal X-Pan, Tri-X, and others). Set for infinity, and use full aperture at f/4.5 or better. If the aurora is very bright, try color photography, using Kodachrome or Ansco color. The exposure time may vary from 1/25 of a second up to thirty minutes, depending on the brightness of the aurora, as well as the characteristics of the camera and film you used. In any case, take several pictures, varying the exposure time, if you are trying this for the first time. Use a fast developer, within the limitations imposed by the type of film that was selected.

In all your endeavors, be sure to keep a record of the camera settings, exposure time, type of film and developer, and date and time of observation. If you are tempted to enter your best pictures in a contest, that information will be required.

In the month of February, the moon will be full on February 4, and the New Moon will occur on February 18.

All planets will be seen in the morning sky.
Mercury will be seen best early (continued on page 108)

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

The Spirit Is Lacking

"ONCE AGAIN, AS in our revolutionary period, we have come upon times that try men's souls, only now we are not rising to the danger with the spirit of earlier days." So writes George Price, in an article in *Life Magazine* entitled—*Arguing the Case for Being Panicky*. It is a thought-provoking article by a man who was identified with the Manhattan Project, a teacher at Harvard, and a researcher at the University of Minnesota. It should be required reading at the beginning of a new year.

Price strikes out at smugness, particularly in politicians who "have acted as though it were a sign of merit never to have changed their minds or admit that they ever made a miscalculation." But he fails to point to similar smugness in the fields of science education, except to say that we "will probably continue to have the world's best TV comedians and baseball players, and in a few years Russia will have the world's best teachers and scientists. Right now, *hard at work* in Soviet schools and universities, are the youths who, ten years from now, will most certainly enable Russia to lead the world in science."

What to do?

Price suggests that what we should do about the situation is to "decide what we really want most in the world. For that is what we will be likely to get. What do we want most? A Cadillac? A color television set? Lower income taxes—or to live in freedom? We will not stay free simply by appointing a science coordinator, streamlining the organization of our missile program, increasing our defense budget by 4% or 5%, passing a bill for federal aid to education, and similar measures . . . It will be only through fundamental changes in our scale of values and our purposes in life that we will be able to survive. What we urgently need—far more than we need

teachers and engineers and scientists—are truly great leaders."

We may argue some of the points raised by Price, but it seems fundamentally right to admit that, in science education, we "have been weighed in the balance and found wanting." It also seems important to point to the fact that we seem to think we can buy our way out of our difficulties by spending more money. Surely, we do need money for the right things, and we need it quickly, but unless we dedicate ourselves to improvement based on honest evaluations, we are through.

Last week, at a meeting of the Geological Society of America, I was talking with one of the men helping to "call the shots" in our national programs for improving the teaching of science. At the beginning of a sentence, he said that his group intended to seek from a tax-supported source \$130,000 for refresher courses for high school science teachers, but then he changed his goal in mid-air, and said that it would probably be \$260,000 instead of \$130,000. I thought that that fund was rather generous for the program he had outlined, but within a week I read in the *New York Times* about a project dedicated primarily to the improvement of the teaching of physics at the high school level. This is to be done through the preparation of a text, motion pictures, a teachers' manual, and other aids to learning. It is headed by top physicists. To support this project, "the total operating fund for the year to next October is \$1,695,000." Boy, have we been pikers!

No panic

Maybe we are at last beginning to "run scared" a bit. We should. But we should not become panicky about it. And, while we are aiming to help teachers in service, we would be foolish to overlook the greater importance of screening carefully those who will train the teachers of the future, and seeing to it that they are adequately prepared—at least in

the academic aspects of their work. It would seem that, in the present panic to spend money, we have overlooked this situation to a dangerous degree. Dollars, or millions of dollars, alone, will not save us from trouble; and trouble is there. Possibly it would be well to place the responsibility for this training of teachers of prospective teachers on the universities; but if we do, then the universities should accept this responsibility seriously. I am not convinced that that is the case. I have written on this in these pages before, as you know.

In the present state of interest in physical science, we cannot afford to overlook the possibility that the solution of our present difficulties may rest in part, also, on an understanding of biology and particularly biology as it bears on man's ability to manage the growth, development and behavior of plants and animals. It would be catastrophic to assume that peace can be attained solely through channels offered to us by the physical sciences and by the economists.

Difficulties with English

We must get back to training in the disciplines associated with progress in exact fields. Within the week, I learned of difficulties that arose, recently, in a Philadelphia museum where high school graduates who sought employment could not do what was needed because they just did not know the alphabet, and how to use it to look up references. Also within the last week, a brilliant college student told me that he had difficulty in his English work because he had no conception of the nature of grammar when he got through high school, that he did not even know what a pronoun was, or how to use one correctly in writing good English, as was required in his work in journalism. How can we engage successfully in personal or international diplomacy if we cannot use skillfully and accurately the words that are necessary to express ideas that well might be effective in influencing the use of destructive devices developed by the physicists? The pen really may be mightier than the sword, but it should be wielded with the greatest of skill. A slip of the pen may be more dangerous than slips of the tongue or of the sword. Conviction which molds purpose and determines action possibly might be satisfac-

torily effected by the wise use of words, as well as the wise use of molecules. We may have abandoned the doctrine of formal discipline in some fields, but we have not abandoned recognition of the value of such highly disciplined subjects as mathematics and science.

Price decried the politicians who have acted "as though it were a sign of merit never to have changed their minds or admit that they ever made a miscalculation." Possibly it is time to consider testing this rule against some of our work in the field of science and nature education.

Billionth Tree

A symbolic "billionth tree" was planted in December at Macon, Georgia, by Governor Marvin Griffin, to commemorate 1957 as a record-breaking year for reforestation tree-planting. Secretary of Agriculture Benson pointed out that the number of young trees planted during the year 1957 totaled nearly one-half of all those planted by the old Civilian Conservation Corps between the years 1933 and 1942, and the State of Georgia was chosen as the site of the billionth-tree-planting because its private land owners had planted more trees by the end of the year than those of any other State.

Museum Visitation

During the twelve month period that ended June 30, 1957, 1,859,305 people visited the American Museum of Natural History in New York City. During the same time, there were 608,411 who visited the Hayden Planetarium—the largest attendance at the Planetarium for any fiscal year since it was opened.

Refuges Approved

The Migratory Bird Conservation Commission has approved proposals by the United States Fish and Wildlife Service for the establishment of a new 10,157-acre wildlife refuge in the area known as the Oak Orchard Swamp, in western New York State, to service the western portion of the Atlantic flyway. In addition to acquiring land for the new refuge, more acreage will be joined to several existing areas in the central flyway, notably at Quivira, Kansas, where 16,681 acres are to be added to the refuge there. The total new land area authorized for acquisition amounts to 31,003 acres, to be purchased with money received from the sale of the federal "duck stamp."

Conservation Learning

The Wildlife Management Institute, of Washington, D. C., reports that suburban pupils, in grades six through twelve, of the State of Virginia's public schools have a greater conservation knowledge than do the students of large cities, towns, or rural districts. This finding was drawn from a 100-question examination prepared for students in 61 public schools, by Robert H. Giles, Jr., as a research project while a candidate for an advanced degree under the Virginia Cooperative Wildlife Research Unit at Virginia Polytechnic Institute.

Probing Jupiter

The American Museum of Natural History—Hayden Planetarium has recently commenced a radio-astronomy project to investigate the radio frequency noises emanating from the planet Jupiter. Dr. K. L. Franklin, the principal investigator, hopes that the study will contribute data that will aid in determining the cause of the static emissions from that planet.

Duck Stamp Design

The winning design for the twenty-fifth federal duck stamp, for 1958-1959, was produced by artist Leslie C. Kouba, of Minneapolis, Minnesota, assistant Secretary of the Interior Ross Leffler has announced. The stamp will feature several Canada geese feeding in a picked cornfield in the upper midwest country, and was chosen by a judging committee composed of members of the Advisory Committee on Fish and Wildlife. A total of 96 designs were submitted by 55 artists in the contest. Four artists whose designs had been selected in previous years again submitted entries; like all entries, these were handled with complete impartiality.

Bulletin

"The American Museum of Natural History—Eighty-eighth Annual Report" is the annual account of the far-flung interests and activities of the American Museum of Natural History, from July, 1956, through June, 1957. The yearly story, finely printed and illustrated, of an institution where the most commonly heard expression on the part of the visiting public is "I never knew that before!"

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THE Nature CAMERA

By EDNA HOFFMAN EVANS

Recording Ancient Art

HAVE YOU EVER THOUGHT OR what life would be like without a camera?

To some of us, anyway, a camera has become a necessity, along with a number of other so-called luxuries that are available these days. To a commercial photographer, a camera is a tool; but I have noticed that many commercial photographers also use cameras for recreational purposes. As for thousands of us who are photo-hobbyists, life would be dull, indeed, if we did not have our trusty cameras to play with.

What was life like in the B. C. days (Before Cameras, that is)? What was living like before mankind had any of the devices and appliances that both enrich and complicate present day living?

Cameras for serious use—hobby or professional—have been available for about a century, although their current widespread popularity is not much more than a couple of decades old. Cameras, as curiosities, go back much farther—back to the days of Leonardo da Vinci and the *camera obscura*.

Mankind always seems to have had the desire to express himself artistically and, to my way of thinking, use of camera and film can be every bit as creatively artistic as use of paint, palette, and brush, or mallet, chisel, and marble. "Artists" may not agree, but I am sure that legions of serious camera fans will line up on my side of the argument. Man has always wanted to draw, to paint, to reproduce in one form or another the ideas he has in his mind, or the beauties he sees around him.

Costly art

Of late, primitive art has taken its place as a full-fledged and respectable member of the fine arts family. Judging from the prices of books on the subject, or samples of primitive art that I have seen lately, primitive art is not only respectable and dignified—it is downright expensive, as

well. Perhaps that is because primitive areas of the world are shrinking; scarcity, whether caused by age, or by lack of practicing artisans, has inflated the asking price.

But there is one form of primitive art, out here in my Southwestern habitat, that is to be seen by all who care to look for it, and even collected by those who have the means of moving it. The art form I am talking about is called a petroglyph. Whenever I see one, I feel that some prehistoric Southwesterner, lacking a camera, had to give vent to his artistic impulses by scratching his ideas on a rock.

Just what is a petroglyph? Broken down, the word means *petro* (rock) and *glyph* (carving). It is different from a pictograph—*pictus* (painting) and *graph* (writing)—because a pictograph tells a story by means of pictures. Perhaps the pictograph is closer to photography than the petroglyph, but both, I think, gave artistic outlet and satisfaction to their creators. Anyhow, there are more petroglyphs than pictographs in my part of the country, and the rock carvings are apparently much older.

Archeologists have not paid much attention to the petroglyph. Indeed, some have diagnosed them merely as "the idle scratchings of lazy Indians." But I do not agree with that diagnosis. No lazy person would expend the energy required to scratch the markings into the rocks. Also, no lazy person would bother to climb to the inaccessible places where I have found some of the most interesting and artistic petroglyphs.

Ancient doodling

These strange drawings can be found in many different forms. There are geometric designs—spirals, squares, sunbursts, swastikas—there are patterns that might be primitive maps and charts; there are mazes, combinations of dots, and doodles of all descriptions. There are prints of hands, and occasionally of feet. But the drawings I like best are



Here is a more isolated boulder on which petroglyphs have been inscribed. The most obvious ones are geometrics, although a few animal figures also can be seen.

those depicting animals to be found in the region. Had they lived in these days, instead of way back when, I am quite sure that some of those petroglyph-producers would have been first-rate Nature photographers.

It is interesting to note the various types of animals and birds depicted in the drawings. Most of the creatures that served as models still can be found in the same areas today (except in places where cities have grown up on the sites of old hunting grounds and camping places).

Probably the most numerous of the large animal drawings are those of deer, goats, and sheep—toothsome dainties that tempted a hunter's skill, and served as the main course for a primitive feast. The skill with which some of the animals are drawn is rather remarkable, considering that the only media at hand were a flat stone surface and a second rock fragment to serve as a pick or pencil. Bird drawings are rarer, but when found they can be recognized as cranes, wild turkeys, and an occasional duck.

Commonest of all the animal drawings is that of either a horned toad or lizard. Its construction is simple—a circle for a head, a straight line for body and tail, crossed at the right places by other lines for legs and feet. There are snakes, too, as well as centipedes and scorpions. One of the best rattlesnake drawings I have seen—complete from wedge-shaped head to rattle-buttoned tail—

is drawn high up on a cliff face. Whoever climbed up there and hung by tooth and toenail while making the drawing, really had a creator's urge to record "rattlesnake" for posterity.

It is easy to find petroglyphs in this part of the country—if you know where to look for them. Usually they are most numerous along watercourses (even dry ones) and at the openings of passes leading from one mountain-ringed valley to another. Old camp sites, too, are fertile petroglyph hunting grounds. Sometimes there are only a few to be seen; sometimes the rocks are literally so covered with them that one drawing overlaps another.

Formidable cat

The most ferocious looking petroglyph I know of, and one of the largest, is to be found on a rock slab outside the museum in the Petrified Forest National Monument. The figure, which is about two feet wide, depicts a puma or mountain lion, a creature equipped with such formidable curving claws and snarling mouth that the original animal must have been the terror of the countryside all around. "Newspaper Rock," another site in the Petrified Forest, is a vast conglomeration of drawings of all descriptions. Those are only two of many—they are to be found in Arizona, Utah, Nevada, California, Washington, Oregon, New Mexico, Old Mexico—all the regions

that supply rocks for raw material. Nor are petroglyphs confined to the West, or to North America. People who study them report almost identical finds, geometrics as well as animals, in many parts of the world. They can be found on the coastal rocks of Spain, and in Ireland, in Australia, Hawaii, and along the rivers in South America.

Photographing petroglyphs has been one of my hobbies for several years. I have quite a collection of them, recorded in both black-and-white and color. They offer a challenge, as do all camera subjects.

Located on cliffs and boulders as they are, there is no difficulty in getting them to hold still. They have been in place since long before our European ancestors set foot in this country, and will be there until an earthquake, a bulldozer and blasting crew, or the slow forces of erosion finally destroy them.

There are other photographic problems, though, that help to complicate petroglyph picture-taking. In the first place, some of them are so situated that the photographer must hang by his heels from a cloud in order to get a good shot of them. Composition is a problem, too, for a picture must be composed so that the viewer can tell what it is without hundreds of words of explanation.

Lighting is another important factor. Sometimes the drawings are sharply defined, scratched through



Petroglyph-covered rocks like these are sometimes called "newspaper rocks," for certainly primitive artists inscribed a lot of news on them. This one, near Phoenix, Arizona, is more accessible than some, and for that reason is also an easy prey to modern Kilroys.

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the dark patina and standing out light against it. At other times, there is not too much contrast between the drawing and its background. In all cases, I think, it is best to take the picture when the sun is shining on it. For east-facing shots, especially those in narrow canyons, this often means getting up early to take advantage of a brief period of morning sunlight. Whenever possible, it is well to have some contrasting object or figure so as to give an idea of size. A glove, an exposure meter, a ruler give an indication of measurement; my dog has posed beside petroglyphs many times, and so have whatever friends I can drag along on my petroglyph-hunting expeditions.

Today, petroglyphs are meaningless, and apparently of no great scientific interest. To me they are fascinating, and I only hope they can survive the roving marksman's pot-shots, the Kilroys who go everywhere, picnickers with bonfires and pop-bottle missiles, and the rapid encroachment of settlement into once-remote areas. If they can survive, perhaps, some day, the petroglyphs will be deciphered as storehouses of primitive information—like a photographer's scrapbook from long ago.

RANDOM NOTES

The man-at-the-camera-shop, with whom I like to visit when time permits, says that the Japanese-made Miranda is now the best buy for the serious amateur who wants a good, versatile 35mm. camera. He says it has taken the place, price-wise, formerly held by the German-made Exakta. The Exakta, on its part, has moved up into almost as high a price bracket as the luxurious (but always super) Leica.

The Miranda, manufactured by the Orion Camera Co., Ltd., Tokyo, and available through most dealers in this country, sells for something under \$200. It is a pentaprism single lens reflex camera, with shutter speeds up to 1/500, focusing range down to 16 inches, great lens interchangeability, and synchronization for both conventional flash and strobe. Japan has really come to the fore in recent months, and is producing cameras equal to some of the best European-made and domestic ones on the market.

Eastman's annual teen-age photo talent contest is now under way, with the closing date set for March

31. Prizes total \$10,400, and the competition is open to high school students in all parts of the country. This year entrants will compete only against others in their own grade: freshmen against freshmen, seniors against seniors, and so forth. Young people interested should write for "contest cues" and other helpful information to Kodak High School Photo Contest, Rochester 4, New York.



Plane Tree

(Continued from page 80)

pared favorably with city water. Proof of maple sap, as Indians knew and Vermonters still know, is in the boiling. So we boiled that sap. As the container approached the burning point, a few drops—rather less than a spoonful—of atrociously bitter brown substance remained, with perhaps a slight undertone of sweetness. The London plane, in short, had demonstrated quantity production, but not quality. Its kind promised nothing for dining-hall pancakes, and the tree of the experiment was presently sacrificed with that much less regret to the necessities of a growing campus.



Sharpshooter

(Continued from page 79)

scratching. Hearing a shrimp snap close to the walls of a tank, one may look around, expecting splintered glass and rushing water.

There are many of these snapping shrimps in the tidepools, and they usually can be heard, and sometimes seen, but are seldom caught because they are so active. They frequent deeper water, also, and anyone who has been anchored over a shallow reef in a small boat has heard sounds somewhat like a civil war in miniature, caused by the "snaps" of *Crangon* echoing off the boat bottom.

If the pistol shrimp happens to lose its large claw, something that may happen during rough handling, or if the shrimp is caught by a claw and must lose it to get away, another will grow in a most peculiar manner. Like all the arthropods, or joint-legged animals, the hard skeleton, when present, is on the outside of the body, and must be shed periodically to allow for growth. If the pistol hand is lost, the other hand will become larger at the next molting, and the wounded hand will proceed to regenerate on the stump. The new hand will

grow folded up on this stump, and at the next shedding will straighten out and become a usable hand again, about two-thirds the size of the lost member. Those who have observed this phenomenon closely, and have experimented, say that the shrimp will shed more quickly than normal if the hand is lost, and no apparent growth will have taken place. It is merely a means of rearming itself for protection, and for capturing food.

When the tide cycle changes, and the waters return again, it does not signal the close of the hunting season for the little tidepool gunman. It simply means that the animals that were brought to its doorstep by the low waters will be more active and harder to catch, and that the marksman's aim will have to be a little sharper!

Atoms

(Continued from page 78)

of more recent date could give a wrong answer to a test of campfire charcoal. Cosmic rays continually bombard samples. Even man himself gives off some radioactivity—sometimes more than that of the sample. Atomic bomb operations have increased radioactivity of the air. Equipment to protect the samples is difficult to build, and the cost of tests is high. Nevertheless, a constant stream of new "dates" is being recorded for the study and deliberation of scientists.

When Dr. Libby first developed this new method, he used radiocarbon obtained from the controlled burning of a small portion of a sample. But carbon is particularly subject to contamination, and now all laboratories convert the carbon to pure carbon dioxide, or to methane or acetylene gas for testing. The gas method greatly increases accuracy, and will push back the time that can be closely measured to perhaps 100,000 years. Present-day samples cannot be used for controls because of the increased radioactivity in the air from atomic bomb explosions, but there always will be plenty of samples of pre-1947 age available for use.

Scientific journals continually report new "dates" to be added to our rapidly growing calendar. Possibilities for adding to our accurate knowledge of the history of our world seem endless, thanks to the new research tool, radiocarbon dating.



A Small Pet

Pete, a mammoth New Orleans cockroach, could not have been more friendly had he been my dog; and for many years, after I moved to California from Louisiana, he lived in my pockets, both at the shop and at home. My wife never did come to fully appreciate Pete, but she tolerated him because of his obvious love for me, and his willingness to endure anything to stay with me.

Friends often saw Pete at the shop, and several ladies, badly startled, tried to swat him, and they would lecture me on how "dirty" cockroaches were, and how they might be carriers of disease. But I did not care much for women customers, anyway, and all the men liked Pete.

I had no way of knowing how old Pete was, when he adopted me; but one morning, while he was on the desk, my pet made that transition that is the lot of all living things, and his physical form was returned to the earth. My dog, Mike, had liked the little pet, and had much enjoyed watching it. Mike was tolerant even when Pete rested on his paw, and the cat, Pounce, learned not to try to catch him. It appears that deep affection works wonders between animals, for their awareness of human love seems to be readily absorbed, and they are the more trustworthy for it.

THEODORE WHITE SMALL

Misplaced Sympathy

It was a day in autumn, and our little group was strolling about the building. We had reached the porch, when someone pointed out a toad that apparently had become stuck in an opening of the latticework around the porch. "Oh, you poor toad," was the universal exclamation—for, while the front legs and head of the little animal were out of sight, it was obvious that the rotund body was too large to follow. The hind legs were stretched to their utmost, and the toad was literally standing on its toes. It must have jumped, to reach that particular opening.

Obviously, the toad needed help; so my sister courageously grabbed it by the plump body, and pulled it back. Round-eyed with astonishment, the creature eyed us as it squatted on the ground panting nervously.

After lunch, we decided to see whether or not the toad was still around the building. It was; and

furthermore, it was in the same aperture, and the same position, as when we had first found it. There was only one conclusion to be reached—the toad knew what it was doing, and could probably succeed without our help. It wanted to hibernate under the porch, and would probably do so, as soon as it had digested its dinner.

EMMY RUSACK

The Helping Hand

Not long ago, I was a passenger on one of the Pan American Airways planes that makes the trip between Miami, Florida, and Rio de Janeiro, Brazil. We had landed at Miacuetia, Venezuela, to take on fuel; and, for some reason, I had stopped at the edge of the ramp, instead of going with the rest of the passengers into the station and service area. It was a little after the noon hour, and the concrete ramp seemed to be trembling with the heat waves of a strong tropical sun.

It was not long before my attention was attracted by the appearance of two dogs, walking side by side, and headed nearly in my direction. The larger was carrying something dangling from its mouth, and the smaller seemed to be trying to grab the dangling object from its partner, in a playful manner. As the two dogs came closer, it was obvious that the first had a lizard, whose tail and hind parts were dangling in the air. Both the animals walked into the shade of the aircraft wing, and lay down by one of the main landing wheels.

Now the first dog allowed the lizard to drop to the ramp, and it made a feeble effort to crawl away, but in vain—the pair would pounce on it, and commence mauling it again. With a few quick steps, I reached the dogs, and spoke to them in a friendly fashion; and, as they looked up at me, the lizard escaped, and wedged itself under the front of the big tire. The tiny creature had not improved its position; in a few minutes, seventy tons would pass over its already-bruised body!

I placed my left palm on the ramp in front of the lizard, thinking to nudge it with a pencil; but, as I reached into my pocket for the pencil, the lizard wiggled out, gripped the edge of my hand with tiny claws, and lay down flat in my palm. The dogs were keenly interested in this procedure, but I made them desist, and took a peep at my new

friend. It was a striking bronze, green and brown animal, with pink-and-gold eyes, and was about six inches long. Its skin had been roughed up a bit, in places, there was a kink in the tail, and the lizard seemed thoroughly exhausted. I eased it into one of my coat pockets.

After thirty minutes or so, the loud speaker announced our imminent departure, so I walked over to a nearby garden strip, where there was plenty of grass and thick shrubbery, carefully took the lizard from my pocket, and held it in my open hand. The lizard peered about, seemingly on the lookout for the dogs. Suddenly, it disappeared up my shirt-sleeve—a move I had not expected. I removed my coat carefully, picked the creature from my sleeve, and put it on the ground. The lizard now appeared to have made a fine recovery, and after a few seconds it scurried away, and disappeared under the rose bushes.

An impatient voice made the air vibrate. "Passenger Gray, please report for loading!" I moved up the passenger ladder, dragging my coat. Somehow, I felt fine—really fine, all over!

H. E. GRAY

For Outdoor People

A few short miles south of the New Hampshire State line, in the Connecticut River valley of Massachusetts, is the Northfield and Chateau, at East Northfield, a resort that is owned and operated by the Northfield School for Girls and the Mt. Hermon School for Boys. While the resort is open the year around, it should prove especially appealing to folks who love to ramble a rolling green countryside, who like to study Nature at first hand on quiet trails of the woodland, or who, perhaps, follow bird life with binocular and camera. There is no more fitting a time to think of summer than during the winter; and, of course, with summer comes vacation-time. Outdoor people might well consider a vacation at the Northfield and Chateau, enjoying its background of trails through a country rich in its variety of tree, bird, mammal, and other life. Mr. A. Gordon Moody is the manager of this famous country Inn, and the man in charge of maintaining the natural attractions of the 250-acre estate is Edward Finch, the resident manager. Inquiries may be directed to them at East Northfield, Massachusetts.

Sea Shells

(Continued from page 95)

Florida back, and kept it until the Americans took over in 1821. After that, the Castillo became more or less a prison.

Chief Osceola of the Seminoles, during his hostilities with the white man, was picked up south of Saint Augustine and escorted to the fort. But he did not stay there long. He was removed to Fort Moultrie, in South Carolina, where he died not long after his transfer. Indian troubles in the American West later furnished another batch of prisoners for the Castillo, this time a band of Geronimo's intractable Apache warriors.

For several centuries, builders in Florida had to use coquina if they wanted a permanent structure. Indeed, even in the present day of concrete and cement-block, there is plenty of coquina used on the East Coast of Florida. A walk through old Saint Augustine's narrow streets takes you between long walls of age-darkened coquina, and here and there you will find some newer shell-rock construction, also. Even the quarrying methods used today smack strongly of the seventeenth century. Coquina for modern work is wedged from quarries not far from where peon and convict labored for the Spanish Crown.

As you wander through the Castillo, with its guardrooms, dungeons, chapel, storerooms, and living quarters, the smell of lime is strong—you have the feeling that *Donax*, shelled inhabitant of an ancient sea, was the original fort-builder; certainly his remains are with you there in countless numbers!

Astronomy

(Continued from page 101)

in the month. It will rise about an hour and a quarter before the sun on February 1, but will be lost in the morning twilight by February 15.

Venus, in Capricornus, will rise in the southeast about two hours before the sun on February 15. It will become gradually more favorable for observation as the month progresses. It will be the brightest object in the sky (magnitude —4.1).

Mars, in Sagittarius, will be rather inconspicuous (magnitude —1.5). It will rise in the southeast, two and one-half hours before the sun on

February 15, and will remain low in the sky.

Jupiter, in Virgo, will be found in the east of Spica. It will rise in the east at about 11 PM, and will be to the southwest by dawn.

Saturn, in Ophiuchus, will be found to the east of Antares. It will rise in the southeast at about 3 AM, and will be found low in the south by dawn.



Diving for Specimens

Dr. Willis E. Pequegnat, professor of zoology at Pomona College, Claremont, California, is a man who likes to come to grips with his specimens at first hand. Instead of using the more conventional methods of dredge and trawl on the rocky reefs of the coast of California, from Corona del Mar to Laguna Beach, Dr. Pequegnat uses an aqualung and other new types of skin-diving equipment to penetrate the waters to a depth of a hundred feet. Dr. Pequegnat reports that he has found a number of new animals through his direct style of investigation, most of them invertebrates, and the Office of Naval Research has renewed a contract with him for submarine biology research along the southern California coast.

Foresters Elect

The Society of American Foresters, of Washington, D. C., has announced the election, December 2, 1957, of George A. Garratt, of New Haven, Connecticut, as president of the Society for the two-year term of 1958-1959. Henry J. Malsberger, forester and general manager of the Southern Pulpwood Conservation Association, and a forestry graduate of Pennsylvania State University, was elected vice-president. Organized in 1900, in Washington, the Society of American Foresters has a membership of more than 11,000 professional foresters in the United States and Canada.

Rare Quail Chicks

Zooneoz, the lively monthly publication of the Zoological Society of San Diego, California, and the San Diego Zoo, reports that six chicks recently were hatched to their elegant or Douglas quail. The Douglas quail, says *Zooneoz*, is the rarest species in the world, both in the wild and in captivity, with a range that is limited to the State of Sonora, Mexico.

Bulletins

"Ward's Nature Guide Catalog," No. 579, and Ward's Mineral Specimens," catalog No. FM10, are two publications of Ward's Natural Science Establishment, Inc., for the hobbyist and amateur whose interests run to the natural sciences. If you are an insect, plant, sea shell, mineral, or fossil collector, catalog 579 offers many items available from this long-established firm. For the rockhound and mineralogist, catalog FM10 has many fine specimens and much equipment, including a good assortment for the enthusiast for radioactive and fluorescent objectives. The firm's address is P.O. Box 24, Beechwood Station, Rochester 9, New York.

"Managing the Small Forest" is Farmers' Bulletin 1989 of the U. S. Department of Agriculture, outlining some of the general rules of good forest management for owners of small forests, or for prospective owners. Illustrated with photos, line drawings and charts, it is twenty cents, from the Superintendent of Documents, Washington 25, D. C.

"Edmund Optics," catalog 579 of the Edmund Scientific Company of Barrington, New Jersey, comprises 76 pages of optical and other equipment that seems to include everything from a simple lens selling for fifteen cents, to a war-surplus sixty-inch army searchlight with full equipment, selling for—well, considerably more than that. In excess of 1000 items for hobbyists and experimenters in telescropy, photography and the like, for profit, study and fun, are listed here.

"Science Books for Children" is Cornell Rural School Leaflet, Teachers Number, Vol. 51, No. 1, by Verne N. Rockcastle, an annotated list of children's science books selected from those published since the last *Elementary Science Library* number of the leaflet appeared in September, 1949. An invaluable reference source for the teacher of the elementary sciences, from the New York State College of Agriculture, Cornell University, Ithaca, New York, 25 cents.

"The Fir Engraver," production research report 11 of the U. S. Forest Service, discusses the biology, habits, and control of the destructive fir engraver beetle, major enemy of the true fir in our western forests. Illustrated, it is fifteen cents, from the Superintendent of Documents, Washington 25, D. C.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

Junctures in the Body

1. Digestive System

HERE ARE numerous places within the body of any of the higher forms of animal life where tissues change over from one type to another—where a transition is made from one kind of cell or construction to a different one—and these junctures are of more than ordinary interest, when studied microscopically. Some are abrupt, others gradual. For the present, we shall journey down the alimentary canal, and observe the architecture of the junctional points; later, we may make the acquaintance of other gussets in the human corporation, such as those of the locomotor apparatus, as when tendon attaches to bone at one end and muscle at the other.

In the digestive system, as in certain others, the skin tucks into the body at the external openings, and so both the mouth cavity and the anal canal are lined with skin, modified to adapt to these internal locations. It is softer, moister, and hairless, and constitutes a *mucous membrane*. This arrangement comes about during embryonic development, with the differentiation, in

succession, of a foregut, hindgut, and midgut. These are all continuous with one another, but only become closed tubes in the order named, and all are lined with an epithelium derived from the entoderm; in fact, that is all that the entoderm forms—the epithelial lining of the gut and its outpocketings and derivatives, as the thyroid, lungs, liver, and pancreas.

The foregut extends forward, and is met by an inpocketing of the ectodermal epithelium, constituting the stomodeum or mouth cavity, and, for a while, there is an oral membrane or closing plate that separates the ectodermal from the entodermal portions of the future mouth and pharynx. At this early stage, there is no distinction between the ectodermal cells covering the exterior of the embryo, and those lining the mouth cavity. A short while later, the hindgut meets a similar inpocketing of the ectoderm at the rear end, forming the proctodeum, and there is an anal plate, or membrane, that temporarily separates the two cavities.

Identical epithelia

It is not possible to distinguish, in

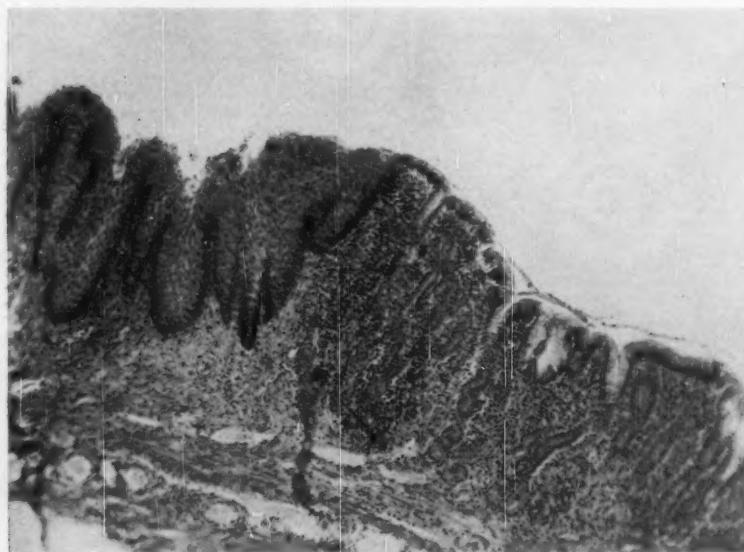
the adult, the original site of the first of these closing membranes. The stomodeum (ectodermal), and pharynx (entodermal), are both lined by the same type of epithelium, stratified squamous, and, histologically, that formed by the ectoderm is identical with that from the entoderm. At the other end of the alimentary canal, the confluence is fairly well marked; the simple columnar epithelium of the rectal canal, which is entodermal, gives way, more or less abruptly, to the ectodermal stratified squamous.

The change-over in epithelial design at the anterior end of the food tube is deferred until the stomach is attained, the stratified squamous type continuing from the mouth cavity all the way down the esophagus. It is possible to state precisely where esophagus ends and stomach begins; on dissection, an irregular line marks the boundary, the mucous membrane of the esophagus being white, that of the stomach pink.

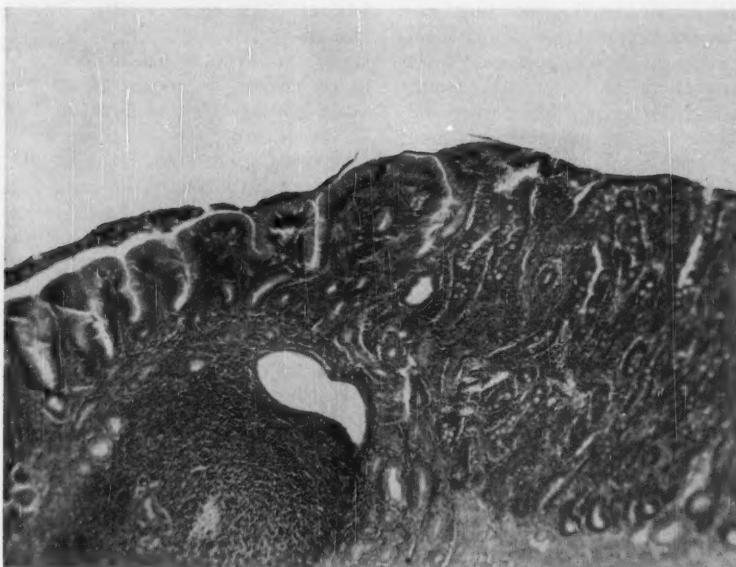
Also, we find that in a longitudinal section for examination under the microscope, the bottom row of cells of the stratified epithelium of the esophagus continues on as the single row of the simple columnar epithelium of the stomach, the other layers ending abruptly as a vertical wall, sometimes an overhanging one, and occasionally recurring slightly farther on as an island or two of stratified squamous cells. There is no such marked change in the other layers of the gut wall. The glands of both esophagus and stomach at the junction are similar, as are also the muscle layers. In the upper fourth of the esophagus, striated muscle is the only kind found. This gives way by degrees, in the second quarter, to visceral muscle, and, in the terminal third, visceral muscle alone occurs. Since striated muscle is voluntary and visceral muscle is not, it is easy to understand how it is that one can will to swallow, but not to regurgitate.

Duodenum next

The next juncture that may be revealed, if we study longitudinal rather than the usual cross sections, is that between stomach and duodenum. A different plan of construction for the gut wall becomes evident here. The stomach lining has longitudinal folds, the *rugae*, which flatten out and disappear upon distention of the organ with food; the intestine, however, exhibits perma-



Junction of esophagus and stomach, I.s., 100X. Esophagus at left.



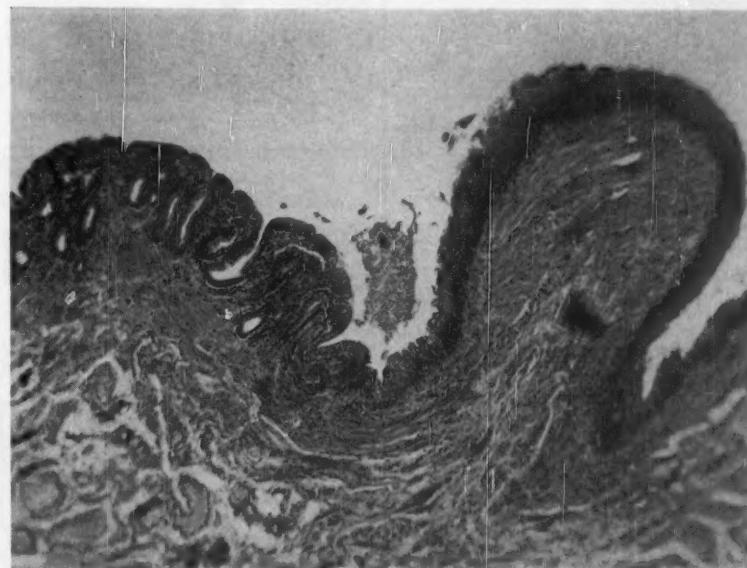
Junction of stomach and duodenum, I.s., 100X. Stomach at left.

ment folds that run transversely, the *plicae circulares*, or valves of Kerkring. They commonly run part way around the circumference of the cavity, often branching, but seldom make a complete circle. Again, the surface of the stomach lining is dotted with fine openings, each leading into a *gastric pit*, the duct of gastric glands, from three to seven simple, branched tubular glands opening into the bottom of each pit. The intestine lining, on the other hand, is covered with an enormous number of tiny elevations, the *villi*, giving the surface a velvety appearance, and around their bases the intestinal glands or *crypts of Lieberkühn* open.

At the pylorus (Gk., gate keeper), which is the junction point, the type of epithelium does not change, but the alteration from gastric gland to crypt of Lieberkühn, and the appearance of the first villi, is abrupt. Lymphatic nodules begin to show up, and the pyloric sphincter muscle will be evident. Perhaps most striking among the changes, though, will be the beginning of the duodenal, or *Brunner's glands*, which are large and branched, and extend down into the submucosa. These are generally confined to, and are characteristic of, the duodenum, although occasionally they may extend forward into the pyloric stomach, or backward into the jejunum, for a few centimeters.

The juncture of small and large intestines is marked by an *ileocecal valve*, made of two folds of mucosa. Villi disappear and so do the *plicae*

circulares, resulting in a smooth internal lining for the colon. The muscularis thickens and forms a sphincter. Upon attaining the rectum, folds of the mucosa again appear, this time longitudinal, constituting the rectal columns of Morgagni. Now the crypts of Lieberkühn shorten, and then disappear. Along an irregular line, the *linea sinuosa analis*, the epithelium changes abruptly to stratified squamous and, about two centimeters farther, at the anal orifice, cornification, hair follicles, and cutaneous glands appear, and we are once more in the realm of the skin.



Recto-anal junction, I.s., 100X. Rectum at left.

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Book Reviews Herpetology

THE ABLEST and most complete work on serpents yet to appear in this country, and the latest gem in the Comstock collection of Nature guides is the *Handbook of Snakes of the United States and Canada*, in two volumes. The authors are that renowned pair of collaborators, investigators, and travelers, Dr. Albert Hazen Wright, Professor of Zoology, Emeritus, of Cornell, and his wife, Anna Allen Wright, lifelong students of ecology and vertebrates, notably of the amphibia and reptiles. Their *Handbook of Frogs and Toads of the*

United States and Canada (1949) is widely known as the finest work in its field. This reviewer was among those fortunate enough to enroll in Dr. Wright's classes, an indelible experience and a precept in thoroughness, precision, and enthusiasm—traits that shine through the pages of this inspiring summation of a lifetime of experience.

After an introduction that explains the organization of material, the some 300 species and subspecies of snakes are considered in sequence. For each is given the scientific and common names, geographical and altitudinal ranges, size, longevity (if data are available), distinctive characteristics, color, habit and habitat, period of activity, breeding—includ-

ing mating, eggs, young—food, venom (if present), enemies, field notes, and list of authorities. A third volume, to consist of a complete bibliography, is forthcoming.

The illustrations, in a work of this type, can make or break it, and those of the Wrights are amazing in number and quality. Each species is represented by a full page panel of numerous photographs, mostly by the authors, showing the coloration pattern of the body from the dorsal, lateral, and ventral aspects, the head, sometimes the tail, and often the whole animal in characteristic poses. It must have taken immeasurable time, labor, and expense to amass these hundreds of pictures. Then, there are the distributional maps and the pages of pen-and-ink drawings of scutellation, hemipenes, and other structural features that accompany the carefully-organized keys. This work will become a classic, and is a must for all who are interested in herpetology.

Vol. I, pp. xviii, 564; Vol. II, pp. ix, 565-1105; profusely illustrated. Comstock Publishing Associates, Ithaca, N. Y., 1957, \$14.75.

Microcommercials

Photographie und Forschung is a carefully written and beautifully illustrated journal, in English, concerning the Zeiss Ikon camera and its work. A recent number included articles on the surgical removal of cysts from the eye, leprosy in the Canary Islands, form and structure of certain mountain ranges in the Himalayas, and document copying with a miniature camera, all fully illustrated in color. The publisher is Zeiss Ikon AG at Stuttgart.

The April, 1957 issue of *Carolina Tips* (Vol. XX, No. 4), published by the Carolina Biological Supply Company at Elon College, N. C., has as its lead article, "Improvised Equipment for Photomicrography," and as a center spread, "A Visit with our Zoology Slide Laboratory," including five large and interesting photographs.

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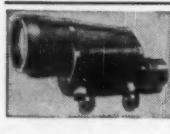
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